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ARIZONA and the WEST

A QUARTERLY JOURNAL OF HISTORY

edited by

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The University of Arizona

VOLUME TWO — NUMBER THREE

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Will C. Barnes in Holbrook, Arizona, in 1885.
U.S. Forest Service Photograph
on file at Arizona Pioneers'
Historical Society, Tucson

A DEDICATION

TO THE MEMORY OF

WILL CROFT BARNES

1858–1936

By ANDREW WALLACE
The University of Arizona

In 1879 young Will C. Barnes arrived in Arizona as a private soldier in the Army's new Signal Corps. Born in California and reared first in a mining town and then on a midwest farm, he was already a Westerner upon reaching the untamed frontier of northern Arizona. He embraced the Territory and called her home for the rest of his life. Fort Apache, in the White Mountains at the headwaters of the Salt River, was the scene of what for Barnes was to be the most exuberant phase of his career and his grandest personal achievement. Later, the open-range cattle lands were to make him a prosperous, respected rancher and citizen. Eventually his love of the strenuous outdoor life and his ever-youthful fondness for range and forest lands drew him into Gifford Pinchot's National Forest Service and into the final, most important phase of his long, productive life.

Will Barnes' own career is a chronicle of the last frontier. He began it fittingly in the Indian-fighting Army, winning the nation's highest acclaim for bravery during an Apache uprising of 1881. In the last days of August of that year Barnes was the telegrapher at Fort Apache, from which Colonel Eugene A. Carr had taken two companies of the Sixth Cavalry to arrest a troublemaking medicine-man on Cibicue Creek. Word came by friendly Indians that the whole command was massacred, and the fort was left with twenty-one officers and men to face certain attack. Barnes volunteered to man an observation post alone, some distance from the fort, to communicate by signal flag. This he accomplished successfully, despite the threat of skulking Apaches, until the "massacred" force of Colonel Carr returned. The fort, however, was still isolated, the telegraph line cut, and the area swarming with hostile war parties. A few days later Barnes and a civilian scout volunteered to carry dispatches to Fort Thomas, fifty miles south. They left by separate routes at night; and despite a close encounter at Black River Crossing, Barnes evaded the savages and rode on until he met a relief column. The civilian scout was ambushed and murdered. A year later, at a ceremony which he proudly remembered the rest of his life, Sergeant Barnes was awarded the Medal of Honor.

With another discharged soldier, Barnes began ranching on the Little Colorado River in 1883. In the declining decade of the open-range cattle industry, he built a high-quality herd when Herefords and Angus were just beginning to displace the Texas longhorns. The year 1897 found him a member of the Territorial Legislature and concurrently engaged in the cattle business at Holbrook. He was by now a first citizen and wealthy businessman, though the stamp of the cavalry-bred cowboy never left him. For eleven years he worked with the Arizona Livestock Sanitary Board. He met Teddy Roosevelt's apostle of conservation, Gifford Pinchot, in 1897; and the men began a lifelong friendship. In 1907 Pinchot persuaded Barnes to put aside his private interests and to enter the infant Forest Service with the title "Assistant Forester and Chief of Grazing." For Barnes this was a new frontier, and he worked with little monetary compensation (or popular approval) to salvage the West's rangelands and preserve the cattle industry from self-destruction.

In 1920 Will C. Barnes was appointed to the United States Geographic Board by President Wilson, and he became its secretary in 1929. During these years he turned more of his attention to writing, publishing his first non-technical book in 1920 and later collaborating with William MacLeod Raine in writing a popular account of the southwestern range cattle industry. Part of the work of the Geographic Board was to investigate and change or authorize names for the physical features on American maps; thus began Barnes' interest in Arizona place names, and in 1935 he finished the definitive book on that subject which no one but he could have written. In 1931 he became associate editor of the fledgling *Arizona Historical Review;* and in succeeding years he contributed many articles on a variety of topics to that publication, as well as many ephemeral pieces to *Arizona Highways.*

Barnes possessed a literary talent that was never fully exploited; but throughout his life he turned his odd moments to recording personal experiences, preserving Arizona's history, or spinning tales of cow-camp life. What he got on paper was good – much of it technical or directly concerned with range management. Our only despair is that he did not find time to write more, for his grasp and treatment of southwestern history – both artistically and critically – are the equal of any who have yet tried a hand at it. His death in 1936 left his *Reminiscences* in manuscript, later to be edited by his intimate friend Frank C. Lockwood and published in 1941. It is Doctor Lockwood's testimony, and undeniably expert opinion, that Will C. Barnes' writings constitute "a very valuable historical fund" for the student of the Southwest.

This pioneer soldier, cattleman, and forester is Arizona's own Horatio Alger, an honest latter-day hero whose career has a genuine lustre certain to endure beyond common celebrity, spanning as it does both the arduous Territorial era and the formative years of statehood.

WILL CROFT BARNES, SOLDIER AND CITIZEN OF ARIZONA

by

PAUL J. SCHEIPS

The author is a staff member of the Signal Corps Historical Division, Department of the Army, Washington, D.C.

BORN IN SAN FRANCISCO on June 21, 1858, William Croft Barnes spent his infant years in a Nevada mining camp, Gold Hill. At the age of seven he went with his widowed mother to live with his grandfather in LaPorte, Indiana. Between the ages of ten and thirteen he lived on a farm at Lake Calhoun, Minnesota; and then, in 1871, he went with his mother to Indianapolis, where he met Booth Tarkington and sang in a choir with James Whitcomb Riley. These were only two of many famous persons Barnes came to know in a long and remarkable life.

In Indianapolis Barnes worked in a music store and ushered at the Academy of Music. At eighteen he was offered a position as salesman of sheet music in San Francisco. Accepting the offer, he moved to the West Coast, where he became interested in the sea and had himself tutored in hopes that he might become a cadet on a revenue cutter. Finally he went to Washington for an examination, but found that there were only three vacancies and 103 candidates – and among these he placed ninth. Not wishing to return to his old job in San Francisco, he sought a berth on an American clipper sailing from New York, but at his juncture met a young Army signalman who persuaded him to join the Signal Corps.

Learning that the Signal Corps had a full complement, Barnes remembered Senator Newton Booth of California, the uncle of his

friend Booth Tarkington. Calling on the Senator, he was taken to meet the Secretary of War and shortly found himself in the Corps as a second-class private. This was in 1879 when Barnes was twenty-one. The Chief Signal Officer was Albert James Myer, the founder of the Corps. Barnes was assigned to the signal school at what is now Fort Myer, just across the Potomac from Washington, D. C., where he learned telegraphy and was put to work, for six weeks, on the construction of a telegraph line from Lewes, Delaware, to Chincoteague, Virginia. "Every day," he recorded in his journal, "was a day of hard work and many pleasures." He was then assigned to San Diego, and shortly afterward to Fort Apache, Arizona.[1]

Fort Apache, or Camp Apache, as Barnes says it was commonly called in those days,[2] was little more than a rude camp "for housing troops;" it was not a fort "in any sense of the word." Life there was anything but comfortable, according to Colonel Eugene A. Carr, the post commandant,[3] who complained bitterly in the fall of 1881 about his assignment:

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[1] For general biographical information on Barnes, see *Apaches and Longhorns: The Reminiscences of Will C. Barnes,* ed. Frank C. Lockwood (Los Angeles: Ward Ritchie Press, 1941) – hereafter cited as Barnes' *Reminiscences.* Other published sources of general information on Barnes include *Who Was Who in America* (Chicago: A. N. Marquis, 1942), v. 1, p. 53; and "Tribute to a Famous Forester," *The Official Record* [of U.S. Department of Agriculture], v. 9 (August 7, 1930). A sketchy, but interesting, original source is the private journal which Barnes kept intermittently from December 16, 1880, to May 15, 1886 – in which most of the entries were made in 1883. The sixty manuscript pages of this journal contain little information on the events of 1881 (though some events of 1879 are recalled), but deal mainly with Barnes' early interest in the cattle business. We are indebted to Mrs. Edith Talbot Barnes for Barnes' "Journal" – so cited hereafter – which is now in the Signal Corps Historical Section File.

[2] According to Ray Brandes' recent *Frontier Military Posts of Arizona* (Globe, Arizona: Dale Stuart King, 1960), the post was officially named Camp Apache from February 2, 1871, until April 5, 1879, when it was renamed Fort Apache.

[3] Carr, an officer of much experience, was said by one writer to be "perhaps the most famous and experienced Indian fighter of the quarter of a century following the Civil War." In 1866 he was mustered out of the volunteer service with the brevet rank of major general, and shortly after he entered the Regular Army. On April 29, 1879, he became colonel of the Sixth Cavalry. During the time Barnes was at Fort Apache, Carr sometimes signed himself "Colonel" and sometimes "Colonel & Bvt. Maj. Gen." – and, of course, he was referred to in official correspondence of the period as both "Colonel" and "General" though he did not secure his brigadier general's rank in the Regular Army until 1892, the year before his retirement. In 1894 Carr was awarded the Medal of Honor for gallantry in the Battle of Pea Ridge, Arkansas, in 1862. See Francis B. Heitman, *Historical Register and Dictionary of the United States Army* (Washington: Government Printing Office, 1903), v. 1, p. 285; and the sketch by Thomas Marshall Spaulding in *Dictionary of American History,* v. 3, pp. 516–17. Additional information may be found among the correspondence in Unfiled Papers: Department of Arizona, Records of U.S. Army Commands (Record Group 98), National Archives. This file is cited hereafter as Dept. of Arizona Records.

> This post is the most isolated in the Dept. The winters are severe and the quarters are uncomfortable. I am living in a log house, builded and added to piecemeal; floor flat on the ground and therefore malarious; roof leaky, whole house very open, and already very cold of nights. Five fires besides the Kitchen fire burning this evening do not make it comfortable. I will be obliged to run eight fires if I live in it this winter with my family, and shall be like "Poor Harry Gill" – But these quarters are still not so bad as the building called Comd'g Officers Qrs. lately occupied by Maj. Cochran; which is a frame shell. . . .[4]

As for the enlisted quarters, it was to be "understood that the four Co. qrs. are already overcrowded, besides being full of bugs." His superior, General Orlando B. Willcox,[5] " did not deign to ask me where I wished to be stationed; does not consult me about the location of the troops of my regiment and ignored the only recommendations on the subject I ever ventured to make." Carr thought that Fort McDowell would have made a better winter quarters, but he really wished that he were at the Presidio in San Francisco or at Benicia Barracks, California. As his letter went up through channels, Carr got little sympathy either from General Willcox, the commander of the Department of Arizona – who said he would taken the matter up with the division commander "whenever Col. Carr makes a definite application in a courteous manner" – or from the division commander himself, Major General Irvin McDowell, who observed that it was in his discretion to station officers wherever they were needed. "It is not seen," McDowell added, "that Col. Carr has any sufficient grounds of complaint as to his station not being a proper one." This complaint certainly did not solidify Carr's position with either of his superiors, who were critical of his later conduct in the Cibicue affair.

Second Lieutenant Thomas Cruse, assigned to Fort Apache after graduation from West Point, was "charmed" when he arrived. Impressed

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[4]Carr to Assistant Adjutant General of Military Division of the Pacific (Presidio, San Francisco), October 23, 1881. – Dept. of Arizona Records. Earlier, at another post, Carr had complained forthrightly about the flour provided his troops in a letter to Assistant Adjutant General of Department of Arizona (Whipple Barracks, A.T.), December 12, 1880. In 1872 General George Crook, then commander of the Department of Arizona, wrote in his annual report: "Ever since the occupation by our troops in Arizona, the public quarters occupied by the troops have been, generally speaking, unfit for the occupation of animals" – 42d Congress, 3d Session, *House Executive Document* 1 (Pt. 2), Ser. 1558, p. 74.

[5]Orlando Boliver Willcox commanded the Department of Arizona from March 1878 until September 1882. See the sketch of his life by Oliver L. Spaulding, Jr., in *Dictionary of American Biography*, v. 20, p. 243.

by the "cool trout streams," the "long and grassy" parade ground, and the snow-capped mountains with their wooded canyons and foothills,[6] Cruse agreed with Barnes, who arrived soon afterward and thought the Fort Apache area "a beautiful spot . . . a sportsman's paradise." It was perhaps a case of one man's meat and another man's poison – depending on whether one was a veteran of the trail who liked a little comfort and thought he deserved better, or a young man who thought life in general was pretty wonderful.

Barnes' 225-mile journey from San Diego to his new post was made via Tombstone, Point of Mountain (later named Willcox after the departmental commander), Fort Grant, and Camp Thomas; he then traveled by pack train through deep snow, arriving at Fort Apache in February 1880.[7] En route from Camp Thomas the train came under Indian fire, but was unharmed. Young Barnes was now experiencing real adventure of the sort boys dream about, or so it seemed to him in retrospect.[8] But there was to be hard work and greater danger.

The work of a military telegrapher with only one assistant, a repairman, was rigorous duty; for, with but one mail a week, the telegraph was used for every kind of official communication. Barnes recalled:

> It was no uncommon matter for a message of a thousand words to be filed by the Commanding Officer for transmission to District Headquarters at Whipple Barracks, Prescott. Almost every day some Arizona post reported an Indian scare, with frequent killings by raids of Victorio's band. . . . These raids kept the troops of nearly all southern Arizona and New Mexico posts in constant field service. Every raid was reported to each post commander in order that they might all be fully conversant with Indian activities. It was a busy wire. . . . An unusually bold raid would bring a general order from the Department Commander keeping every operator at his key constantly until the situation was relieved. Several times I put in thirty-six hours

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[6] Thomas Cruse, *Apache Days and After*, ed. Eugene Cunningham (Caldwell, Idaho: Caxton Printers, 1941), p. 32. In the author's preface, Cruse gives Barnes credit for helping in the preparation of this narrative. For information on Cruse, who retired as a brigadier general, see Heitman, *Historical Register and Dictionary*, v. 1, p. 342; and *Who Was Who in America*, v. 2, p. 138.

[7] Fort Apache has been described as ninety miles south of Holbrook and sixty miles north of San Carlos. – Charles P. Elliott, "An Indian Reservation under General George Crook," *Military Affairs*, v. 12 (1948), p. 97, n. 11.

[8] Barnes described the journey to Fort Apache in his "Journey," pp. 2-6. A few shots fired over the pack train and an engagement, apparently by others, "with Victorio's band right in that vicinity" (*ibid.*, p. 6) became an Apache attack on the pack train in Barnes' *Reminiscences*, where the affair is discussed as a great adventure.

straight time at the key – not working, of course, but ready at any moment to answer a call.[9]

The military telegraph handled many private messages, too, at a penny a word for 500 miles, though official traffic always had priority. Whereas in 1881 there were 5,077 miles of military line on the frontier, there were in the following year only 4,006 miles. As the railroads were extended, military lines were abandoned in favor of private enterprise; but in Barnes' day new military lines were still being built. Thus in 1882 a line was planned from Fort Benson to Camp Huachuca. In the Military Department of Arizona as a whole, with 532 miles of military line in 1882, 123,238 messages were sent. The message load at Fort Apache in the preceding year, with Barnes on duty, was 4,048.[10]

Besides the regular telegraphic work, Barnes recalled that each military telegrapher had to make four weather reports to Washington every day for "Old Probabilities" – as Myer, the Chief Signal Officer was known – since meteorological reporting was a major responsibility of the Signal Corps in those days. Because these reports had to be made according to Washington time, Barnes explained, the Fort Apache operator made his first report each day at 3:39 in the morning:

> There could be no fudging on this business. The instruments had to be read at 3:39, the report made out and put into code all ready for the call signals which came over the wire from El Paso, Texas, at exactly 4 A.M. If you weren't there to answer, you had a painful few moments of wire conference with the Chief Operator, . . . a commissioned officer. Yuma was the most westerly station we had, and it sent the first report. Then, each man, listening to his fellows, picked up the report in his turn, ticked off his ten or fifteen cipher words, signed his initials, got the "O.K." from El Paso, and went back to bed.
>
> This happened four times every blasted day, rain or shine, peace or war, Indians or no Indians, unless the line was down; which it often was. Even then, we had to record the weather and make our report by mail. The last word in our code message at 9 P.M. was our prognostication, "fair," or "foul," as to the ruling weather for the next twenty-four hours. Prescott was at one end of a branch wire from the main line, Apache at the other. It was

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[9] Barnes' *Reminiscences*, pp. 37–38.

[10] See "Report of the Chief Signal Officer of the Army," October 1, 1881, in *Annual Report of the Secretary of War, 1881* [47th Congress, 1st Session, *House Executive Document* 1 (Pt. 2), Ser. 2015], p. 33 ff. See also "Report of the Chief Signal Officer of the Army," September 15, 1882, in *Annual Report of the Secretary of War, 1882* [47th Congress, 2d Session, House Executive Document 1 (Pt. 2), Ser. 2096], pp. 35–36, 40–41, and Chart 23. Several pages of Barnes' "Journal," but not actually a part of it, contain a record of the free (official) business sent over the military telegraph lines in Arizona and New Mexico in October 1878 – more than a year before Barnes arrived on the scene.

> some five hundred miles around that vast U, and about one hundred and fifty across its upper end. I soon discovered that during an average period if it was clear and lovely at Apache, and Prescott predicted "foul" for the next twenty-four hours at that place, it was safe to predict "fair for Apache that time, but to make it "foul" for the next day's prophecy. Nearly all storms came from the west, and the rule generally held good during the seasons when storms were to be expected....
>
> The slender strand of wire which connected Fort Apache with the outside world in 1880 was very primitive. To the Apaches it was an exceedingly mysterious affair. The poles were mostly cottonwood saplings, wired to cedar stubs set in the ground. One pole in fifty, perhaps, could be called straight. The rest were as crooked as a ram's horn.... What with trees falling across it and other accidents, the wire was down about as many days as it was up.[11]

The meteorological station which Barnes tended at Fort Apache had been established on October 9, 1877; but observations did not actually get under way until June 28, 1878, a year before he joined the Signal Corps. Apparently he was a model meteorologist from the beginning, for the Chief Signal Officer reported in 1881 that the inspection of the preceding December had found the station "in excellent condition," the book and records "neatly and accurately kept," and Private Barnes himself "very highly spoken of."[12]

In the fall of 1883 Barnes, now a sergeant and the proud possessor of the Medal of Honor, left the Army and went into the cattle business in Arizona. His military service, as it turned out, was but a brief and exciting preliminary to the career that now opened to him. In the years that followed he made a name of himself in the cattle trade and, after meeting Gifford Pinchot, in the United States Forest Service, which he served with distinction for years as Assistant Forester and Chief of Grazing. Meanwhile he served as a legislator both in Arizona – where, he was proud to say, he put through the bill that, by splitting Apache County down the middle, brought Navajo County into being – and in New Mexico. Besides all this, he was a writer. Indeed, as Dean Frank C. Lockwood has stressed, Barnes wrote much and well:

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[11] Barnes' *Reminiscences*, pp. 38–40. Barnes wrote his mother that the Apaches "call us *Bash-nal-sense-has* – 'iron paper man'" – an allusion to the telegraph – and he described the fun on one occasion when several Apaches were persuaded to talk to each other over the telephones connected to the telegraph line from Camp Thomas to the San Carlos Reservation. This detail is from a clipping in Barnes' "Journal" from *Indianapolis Herald*, n.d., to which his mother had contributed some of his letters of May 1880 after editing them for publication.

[12] "Report of the Chief Signal Officer of the Army," October 1, 1881, *loc. cit.* p. 218.

> He was an untiring and profilic writer, and whatever he penned he was able to make interesting. He wrote unceasingly on a hundred subjects, and published articles, long and short, in scores of journals and magazines. In addition to all this, he contributed to newspapers and little-known magazines notes, letters and articles on matters of natural history and on obscure or disputed points dealing with Arizona's past. Taken together, all this fugitive material constitutes a very valuable historical fund.[13]

Notwithstanding his retirement from the Forest Service in 1928 at seventy, Barnes served as Secretary of the United States Geographic Board – of which he had been a departmental member since his appointment by President Wilson in 1920 – until his resignation, in June 1930, to make a journey around the world with his wife, the former Edith Talbot.[14] Upon their return in 1932 they made their home in Phoenix, where Barnes died on December 17, 1936, after a short illness. He was buried in Arlington National Cemetery. Two years later the Will C. Barnes Butte was dedicated in Papago Park and Military Reservation at Phoenix; and in 1958 a bronze plaque in his memory was unveiled and the Will C. Barnes Memorial Field House was dedicated at Fort Huachuca, Arizona.[15]

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[13] Lockwood's introduction to Barnes' *Reminiscences*, xiv, xxi-xxii.

[14] Will and Edith Barnes were married on May 4, 1897. An illuminating article on Mrs. Barnes, though in certain particulars inaccurate, is Kitty Smith's *"An Arizona Pioneer 'Troops the Line,'"* (Phoenix) *Arizona Republic*, June 8, 1955.

[15] See *The Huachuca Scout*, January 9, 1958. For this data I am indebted to Mary Lee Marek of the U. S. Army Electronic Proving Ground [Fort Huachuca] Liaison Office, Washington, D. C.

A CHRONOLOGICAL LIST OF THE WORKS OF WILL C. BARNES

compiled by Andrew Wallace

"Raided by Apaches – A True Story of Cowboy Life in Arizona," *The Youth's Companion*, October 1885.

"In the Apache Country," *The Overland Monthly*, February 1887 [v. 9, 2d series, no. 50].

"Gifford Pinchot, Forester," *McClure's Magazine*, July 1908.

"The U.S. Forest Service," *Out West*, August 1908.

"Wild Horses," *McClure's Magazine, January* 1909. One of Barnes' best pieces, this was republished in *Atlantic Monthly*, v. 134 (1924), pp. 616–23.

"Our National Bonfires," *Harper's Weekly*, August 7, 1909.

"The Canyon Diablo Meteor," *Pacific Monthly*, April 1910.

"The Stripping of the Hills," *Harper's Weekly*, June 4, 1910.

Western Grazing Grounds and Forest Ranges. Chicago: Breeder's Gazette, 1913. This pamphlet was written as a general description of natural history in the national forests by way of introduction of new men to the Forest Service; its sub-title calls it "A History of the Live Stock Industry . . . of the Arid West, with Particular Reference to . . . the National Forests."

Stock-Watering Places on Western Grazing Lands. U.S. Dept of Agriculture, *Farmer's Bulletin,* No. 592, 1914.

(with James T. Jardine.) *Livestock Production in the Eleven Far Western States.* U.S. Dept. of Agriculture Report No. 10, 1916.

Introduction to J. D. Guthrie's *Forest Ranger, and Other Verse.* Boston: R. G. Badger, 1919.

Tales from the X-Bar Horse Camp. Chicago: Breeder's Gazette, 1920. "The Blue-Roan Outlaw" and 17 other stories which originally appeared in *The Argonaut, American Forestry, The Breeder's Gazette* and *The Cosmopolitan* magazines.

The Story of the Range. U.S. Senate, Committee on Public Lands and Eurveys. Hearings, Part 6, 69th Cong., 1st Sess., 1926. Published separately for the Forest Service, Dept. of Agriculture; Washington: Govt. Printing Office. 1926. "An account of the occupation of the . . . ranges by the pioneer stockmen, the effect . . . of unrestricted grazing, and the attempts that have been made to . . . perpetuate the great natural resources of the open range."

"The Canyon Diablo Train Robbery," *Arizona Historical Review,* v. 3, no. 1 (April 1930), pp. 88–104.

"Winning the Forest Range," *American Forests and Forest Life,* July 1930.

(with William MacLeod Raine.) *Cattle.* New York: Doubleday, 1930. Introduction by Harry E. Maule, and two appendixes: "Home-Made Tools" and "Enemies of Range Cattle." Though not entirely about Arizona, this is still the best book concerning the cattle industry in that state. Republished in 1936: New York, Grosset & Dunlap, under the title *Cattle, Cowboy and Rangers.*

"The Apaches' Last Stand in Arizona," *Arizona Historical Review,* v. 3, no. 4 (January 1931), pp. 36–58.

"The Pleasant Valley War," *Arizona Historical Review,* v. 4 no. 3 (October 1931), pp. 5–34; v. 4, no. 4 (January 1932), pp. 23–40.

"The Honeymoon Trail to Utah," *Arizona Highways,* December 1934.

"Col. James Harvey McClintock," *Arizona Historical Review,* v. 6, no. 1 (January 1935), pp. 67–74.

"Debunking and Relocating Houserock Valley," *Arizona Highways,* March 1935.

"Hosses 'Jest Hosses," *Arizona Highways,* April 1935.

"The Black Canyon Stage," *Arizona Historical Review,* v. 6, no. 2 (April 1935), pp. 49–55.

"Sleepy Tom's Rough Awakening," *Arizona Highways,* May 1935.

"Arizona's Desert Carpet," *Arizona Highways,* September 1935.

"Edward William Nelson," *Arizona Historical Review,* v. 6, no. 4 (October 1935), pp. 43–49.

"When a Brave Man Fainted," *Arizona Highways,* November 1935.

Arizona Place Names (*University of Arizona Bulletin,* v. 6, no. 1). Tucson: University of Arizona, 1935. Barnes' most useful work, it originally appeared in part in *Arizona Historical Review,* v. 5 (1933), pp. 286–301. Long out of print and unavailable at any price, it was republished this year by the University of Arizona Press, in a new and enlarged version, edited by Byrd H. Granger. Barnes' original version, however, is still a minor classic.

"Cattle in the New World," *Arizona Highways,* January 1936.

"Foundling in the Wilderness," *Arizona Highways,* February 1936.

"The Battle of Cibicue," *Arizona Highways,* March 1936.

"Chuch Wagon Tales," *Arizona Highways,* April 1936.

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Apaches and Longhorns: The Reminiscences of Will C. Barnes, edited by Frank C. Lockwood. Los Angeles: Ward Ritchie Press, 1941. This excellent volume is in many ways the best of Barnes' work. It is so scarce as to be a rare book, however, and a new printing is badly needed.

NAVIGATION METHODS OF EUSEBIO FRANCISCO KINO, S. J.

by

RONALD L. IVES

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ONE of our treasured legacies from the Jesuit mission era is the beautiful and famous map "Passo por Tierra a la California," drawn in 1707 by Eusebio Francisco Kino, S. J., known to history as "The Apostle to the Pimas": maker of Christians and builder of missions. So accurate is this map that it did not become completely obsolete until 1912, when Lumholtz' map "Papaguería" was published.[1]

As might be expected, the Kino map was widely circulated and widely plagiarized during the early eighteenth century, so that many versions, many of them not credited to the original author, are now extant. Checking of this map against the best available today shows that all major features of Papaguería are shown in their correct interrelations to a rational scale ("Leguas Castellanas"), that the latitudes are all correct to less than a degree of arc, and that the longitudes are

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[1]Karl Kumholtz, *New Trails in Mexico* (New York: Scribner's, 1912).

all in reasonable proportion. And, as will be shown later, Kino had no way of making rigorous longitude determinations.

Field checking of the may amply demonstrates its practical utility. Almost any reasonably intelligent person using this map – and, in a few instances the descriptions from Kino's notes,[2] or the substantially parallel Manje notes[3] – can recover any site shown on the map, usually within a few hundred feet. This was actually done by the late Herbert E. Bolton in retracing hundreds of miles of Kino's trails; and the present writer has had equal success in the lavas and sand dunes around Pinacate, where Professor Bolton did not go.

Interestingly, although the "Passo por Tierra" is Kino's most famous map, it is not his only competent cartographic effort. Eight Kino maps, still extant, are listed by Bolton;[4] and it seems possible, from internal evidence in Kino's writings, that his total map output may have been as high as twenty. Checking of the known Kino maps, and consideration of the possible additional output not available to us today, both indicate that Kino's title "Royal Cosmographer," granted him in preparation for the Atondo expedition to Baja, California, was not an empty one.[5]

From the viewpoint of our present overspecialized culture – in which a student usually learns "more and more about less and less" until, on finally attaining the doctorate, he reputedly knows "everything about nothing" – it is somewhat surprising to find that a man extensively trained in theology, as was Father Kino, was also an expert in cartography as well as several other fields from architecture to astronomy. Such multiple competences, however, are not uncommon, and apparently never were. Leonardo da Vinci, known to us as an artist, was also a competent inventor and engineer; Sir Isaac Newton, discoverer of the Laws of Gravitation and Motion and one of the developers of

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[2] See H. E. Bolton, *Kino's Historical Memoir of Pimería Alta* (Cleveland: Arthur H. Clark Company, 1919), *passim;* Bolton, *Rim of Christendom: A Biography of Eusebio Francisco Kino, Pacific Coast Pioneer* (New York: Macmillan, 1936); Ernest J. Burrus, *Kino Reports to Headquarters* (Rome: Inst. Hist. S. J., 1954).

[3] See Juan M. Manje, *Unknown Arizona and Sonora, 1693–1701*, trans. and ed. Harry J. Karns (Tucson: Arizona Silhouettes, 1954).

[4] *Rim of Christendom*, pp. 606–610.

[5] *Ibid.*, p. 75.

DRAWN 1701 BY EUSEBIO FRANCISCO KINO, S. J.

TRACED 1948 BY R. L. IVES

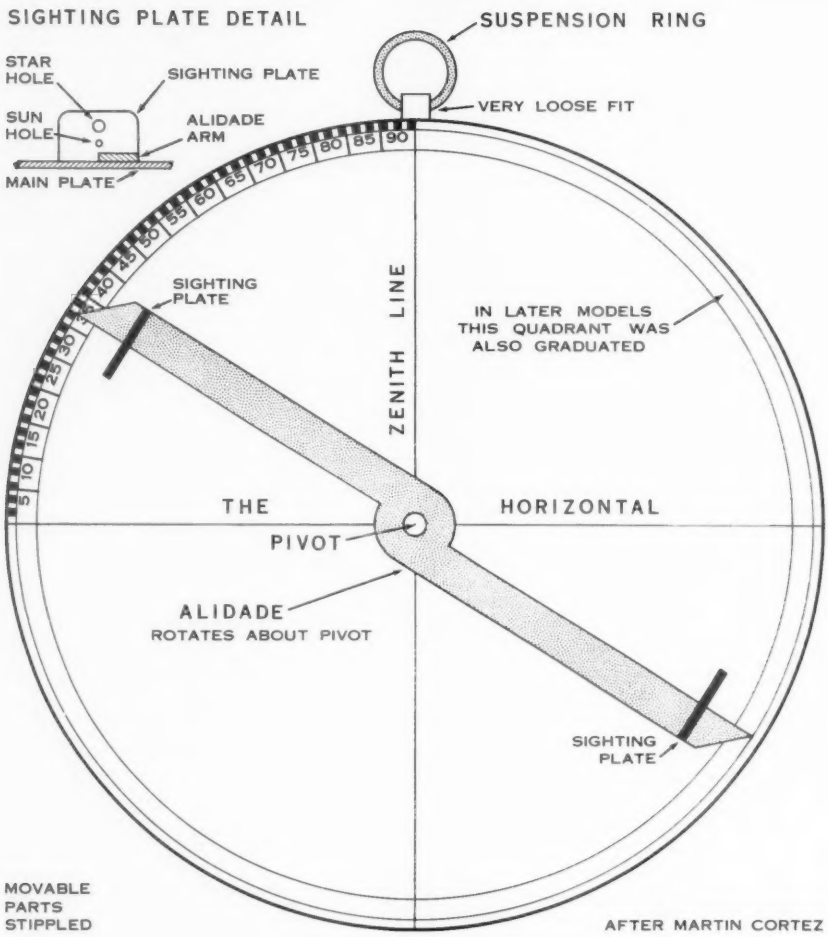

Fig. 1 Summary diagram of a mariner's astrolabe, or shipman's quadrant, based on diagrams and descriptions by Martin Cortes (ca. 1551).

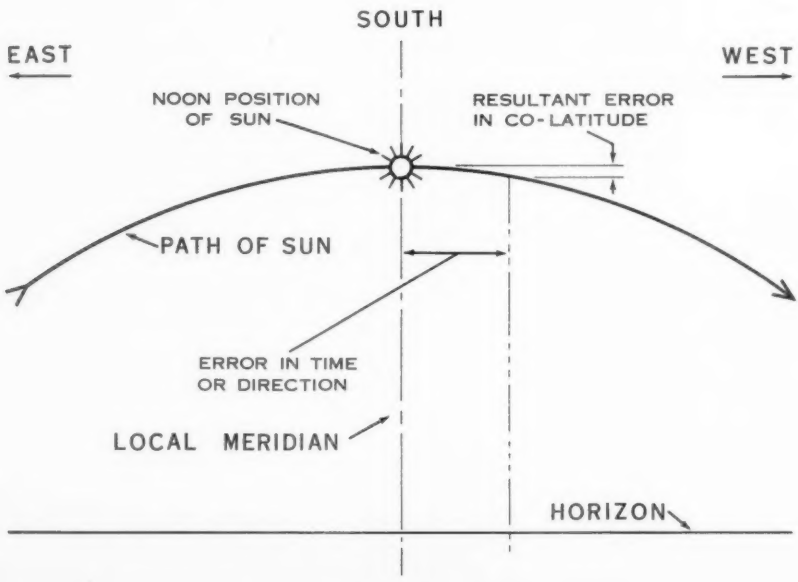

Fig. 2. Errors in meridian altitude sights.

the Calculus, was better known in his lifetime as a theological researcher; William Henry Jackson, pioneer photographer of the American West, was also a painter of respectable attainments and author of a number of meritorious historical papers.

Because of the great breadth and depth of Jesuit training, and of careful personnel selection, we should expect to find a large number of multiple-talented men in that famous order, and such has been the case for more than four centuries. An outstanding early example was Athanasius Kircher, whose published works include a pioneer attempt to decipher the Egyptian heiroglyphics, a very good early work on geology[6] and a description (perhaps the first) of the now-familiar projection lantern. Today we find that Jesuits are substantial contributors to most fields of learning, a current example being Father Daniel J. Linehan who, during a recent tour of duty in Antarctica with primary duties as a geophysicist, was also expert in getting radio signals through the Aurora Australis and reputedly was able to fix "anything from a troubled conscience to a malfunctioning radar."

Modern science is indebted to the Sonoran Jesuits for many gems of scientific observation, among which are Juan Nentvig's [supposedly] description of the geodes of Oputo,[7] Cristobal de Cañas' [supposedly] summary of Indian ceremonial dances,[8] and Pfefferkorn's lucid description of the habits and attributes of the *zorillo*.[9] Kino's own "quest of the blue shells,"[10] which was collateral to his field explorations, was actually a competent ecological investigation, and probably the first American use of "tracers." From direct evidence, largely collected by Bolton, we learn that he also had specific training and associations qualifying him for advanced cartographic work.

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[6] *Mundus Subterraneus* (Amsterdam, 1665).

[7] *"Rudo Ensayo,"* trans. and ed. Eusebio Guiteras, *Records of the American Catholic Historical Society of Philadelphia*, v. 5 (1894), pp. 214–215. Cf. R. L. Ives, "The Geodes of Oputo," *Rocks and Minerals*, v. 23 (1948), pp. 387–391; Ignaz Pfefferkorn, *Description of Sonora*, trans. and ed. Theodore E. Treutlein (U. of New Mexico Press, 1949), p. 82.

[8] "The Sonoran Census of 1730," trans. and ed. Ronald L. Ives, *Records of the American Catholic Historical Society of Philadelphia*, v. 59 (1948), pp. 319–339.

[9] *Description of Sonora*, pp. 115–116. Cf. the substantially parallel account in *Rudo Ensayo*.

[10] Considered in Bolton, *Kino's Historical Memoir of Pimería Alta*, v. 1, pp. 46, 55, 195, 230, 231, 234, 237, 241, 259, 272, 310, 317, 322, 342, 352; v. 2, pp. 87, 170, 174, 185, *passim*. (Similar coverage is given in *Rim of Christendom*.)

The ample records summarized by Bolton show that Kino studied at the famous Jesuit colleges of Trent, Hala, Freiburg, Ingolstadt, Munchen, and Oettigen.[11] These were the Yales, Harvards and Caltechs of seventeenth-century Europe. While at Ingolstadt he studied under Fathers Adam Aigenler and Henry Scherer, both outstanding geographers of their time and authors of important works. While still a student Kino was invited to become a professor of mathematics under the patronage of the Duke of Bavaria. Kino's mathematical studies were undertaken because of the great prestige of mathematics in China, where he hoped to go as a missionary. Because of this same missionary desire, Kino did not accept the proffered professorship in Bavaria. From other sources we know that Kino was familiar with at least parts of Giovanni Battista Riccioli's *Tables;*[12] and at least one member of the Kino party which visited Sierra de Santa Clara in 1701 was sufficiently familiar with the writings of Athanasius Kircher to reason correctly from them. This led to the first North American identification of the extinct volcano Pinacate before the usually-credited discoverers of extinct volcanoes (Desmarest and Guettard) were born.[13]

Academically, then, Father Kino was certainly well prepared for a career as a cartographer. Practically, and prior to his coming to the New World, Kino demonstrated that his knowledge was not just rote memorization of lectures and textbooks. On his voyage from Genoa to Cádiz, he assisted the captain of his ship in the taking of latitudes. Later, while in Spain awaiting passage to America, Kino and his companions constructed a number of compasses and sundials. During his stay in Cádiz Kino observed the famous comet of 1680, giving specific figures on its trajectory and rate of travel. These, plotted on a star map, agree closely with other records of the same comet, indicating clearly

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[11] See Bolton, *Rim of Christendom*, pp. 32–38.

[12] *Georgraphia et Hydrographia Reformata* (Bologne, 1661; Venice, 1672); *Astronomia Reformata* (Bologne, 1669). Father Riccioli, an astronomer of great competence, reportedly was assigned the task of writing an omnidemolitive study of Copernicus' *De Revolutionibus Orbium Coelestium*, then regarded as false and heretical. This study (resulting in the publication, ultimately, of the *Astronomia Reformata*), led Riccioli to the persuasion that the Copernican system (heliocentric) was far superior to the ancient and then accepted Ptolemaic system (geocentric). Largely as a result of Riccioli's studies, the Copernican system became universally accepted.

[13] See Ives, "The Discovery of Pinacate Volcano," *Scientific Monthly*, v. 54 (1942), pp. 230–238.

that Kino's knowledge of astronomical observation was sound and practical. His later description of the comet, published in Mexico in 1681,[14] is a curious mixture of sound science and contemporary beliefs in signs and portents. It is thus clear that, on arrival in Mexico, Father Kino not only had adequate training in the art and science of cosmography, but also had demonstrated his ability to apply that training to the solution of actual problems.

From internal evidence in his own writings and from the diaries and reports of his field companions, we can state with certainty that Father Kino's navigation instruments consisted of a compass – which was probably equipped with a gnomon, so that it could also be used as a sundial – and a telescope and an astrolabe. His navigation handbook was Adam Aigenler's *Tabula Geographic-Horologa Universalis*,[15] which included selected portions of Riccioli's *Tables*.[16] This work, specifically mentioned in Kino's diary,[17] antedated both Bowditch and Weems.[18] Careful checking of Aigenler's Latin text shows that the accuracy of his method was superior to the best instruments available in his time, and consequently that many of the deficiencies of seventeenth-century cartography and navigation were due to instrumental inadequacies rather than to lack of technique.

We have no full description of Kino's compass, but we do know that he made one or more instruments which were combinations of compass and portable sundial; and from this we can assume with some confidence that his field instrument was such a combination. As the design of the mariner's compass was fairly well standardized before 1550 and has not changed greatly since that date, the compass used by Kino probably differed little from those available today – and the method of use in 1700 was almost identical to the most modern methods.

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[14] *Exposicion Astronomica de el Cometa Que el Año 1680. . . .*

[15] (Ingolstadii [Ostermayri], 1668).

[16] Tables of latitude and longitude from Book 9 of Riccioli's *Geographiae Reformatae* are appended to Aigenler's *Tabula Geographico-Horologa Universalis*. Incidentally, Aigenler credits his source fully – an uncommon practice at that time.

[17] See Bolton, *Kino's Historical Memoir of Pimería Alta*, p. 330.

[18] Nathaniel Bowditch, *Practical Navigator* (Salem, 1801); P. V .H. Weems, *Air Navigation* (New York: McGraw-Hill, 1938). Bowditch's manual is still current, after innumerable reprintings and a few revisions. Current editions, titled *The American Practical Navigator*, are available from the Government Printing Office, Washington 25, D.C.

Although it was known before Kino's time that the magnetic compass did not everywhere indicate true north, we have no direct evidence that he made corrections for local magnetic variation, which is now about 12 degrees East in most of Papaguería. As Kino's maps and observations do not contain the errors which would occur if compensation were not made for such variation, we can assume either that this variation was substantially zero in 1700 – which is improbable – or that he corrected for it, at least approximately. This correction is rather easily made for a small area, such as Papaguería, by the standard and well known method of comparing magnetic north, as indicated by a magnetic compass, with true north, as determined by a sight on Polaris.[19] The observed difference is then applied to all magnetic bearings taken thereafter, giving a reasonably valid true north anywhere in the area for a few years after the observation is made. Because magnetic variation is not fixed – due in part to migration of the magnetic poles – local corrections become obsolete in a relatively short time.

Kino set down no detailed description of his telescope, but, as this instrument first became generally known to Europeans about 1609, it was still, in Kino's time, an "advanced" scientific instrument. Although Galileo in 1610 made telescopes having magnifications up to 33, it seems probable that Kino's telescope, which was portable, had a magnification not greatly exceeding 10, an objective not over 2 inches in diameter, and a resolution not better than perhaps 3 seconds of arc. Numerous refracting telescopes, made for use at sea after about 1650, had these characteristics. A better telescope, having a greater magnification, larger objective, and better resolution, was surely available by 1685; but just as surely Kino did not have one. Such a telescope would have been portable only with difficulty, usable only if mounted on a tripod, and usable then only for a few minutes to a few hours a day because of atmospheric turbulence which interferes even with naked-eye observations in the Sonoran Desert.

All of the latitudes specifically recorded in Kino's works were measured by use of an astrolabe, an instrument completely unfamiliar to most twentieth-century readers. In its basic form, the astrolabe is an open-sight pendulum clinometer. As commonly made, the instru-

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[19] Noted by Kircher, *Magnes Siue, De Arte Magnetica* (Colonia Agrippina, 1643). Cf. Frederic H. Lahee, *Field Geology* (New York: McGraw-Hill, 1941), pp. 422–423, 493–495.

ment performed additional functions, serving as a star-finder, a nocturnal clock, or even as a crude form of circular slide rule.

The origin of the astrolabe is lost in the mists of antiquity. Some historians cite excellent evidence to show that it originated in India, some time before the Christian era. Others cite equally good evidence to show that the instrument was developed by Babylonian astrologers, possibly as long ago as 2,000 B.C. Certainly the calibrations on the instruments surviving today show Bablylonian influence, as the circle is divided into 360 degrees, a Babylonian, and not a Hindu, division. The instrument was early adapted by Arab astrologers, who brought it to Spain, perhaps as early as 800 A.D. Knowledge of the astrolabe was officially brought to the Christian world by Gerbert (The Necromancer) of Aquitaine, who studied under the Moorish scholars in Córdova from 967-970, learning not only the use of the astrolabe, but also the decimal system, Arabic numerals, and the "black arts" of algebra and trigonometry.[20] On returning to the Christian world Gerbert taught extensively for twelve years, then advanced rapidly, becoming Abbot of Bobbio (983), Archbishop of Rheims (991), Archbishop of Ravenna (998), and Pope Sylvester II (999-1003). His astrolabe, still extant, has been described in detail by Robert T. Gunther.[21]

By the latter part of the sixteenth century, the astrolabe was shorn of its astrological attrributes, and became a utilitarian scientific instrument. Some of the finest astrolabes ever built are the work of Humphrey Cole (*ca.* 1575), who reputedly made all of Sir Francis Drake's navigation instruments. Many of these instruments, as well as a variety of others of Spanish and Portuguese manufacture, are preserved, many of them in working condition, in a group of British museums.[22] With them, in many cases, are the detailed instruments for their use, and descriptions of just how they were made. A typical mariner's astrolabe, also known as a shipman's quadrant, is illustrated in the summary dia-

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[20] See Horace K. Mann, *The Lives of the Popes in the Early Middle Ages* (London, 1910), v. 5, pp. 91–120.

[21] *Astrolabes of the World* (Oxford U. Press, 1932), v. 1, pp. 230–231; illustrated in Plate LII(2). This instrument, dated A.D. 990, is in the Galileo Tribuna, at Florence, Italy.

[22] Especially the National Maritime Museum, Greenwich; the Science Museum, South Kensington, London; the British Museum, London; the Museum of the History of Science, Oxford; the University of St. Andrews, Fife, Scotland; and Albert Institute, Dundee, Scotland.

gram comprising Fig. 1. This is based on a diagram by Martin Cortez, which, with accompanying descriptions, gives all necessary data for the construction and use of the astrolabe. Geoffrey Chaucer, better known for his *Canterbury Tales,* also wrote a description of the Astrolabe and its use.[23]

Essentially, the mariner's astrolabe consists of a main plate, with a suspension ring loosely mounted at the top. When hung by the ring, the zenith line was vertical, and the horizontal line, at right angles, horizontal. Pivoted at the intersection of the zenith and the horizontal was an alidade, which contained a sighting plate at each end. One or more quadrants of the main plate were divided into degrees, usually numbered with zero at the horizontal, and ninety at the zenith (as in Fig. 1). The sighting plates contained two holes, one, the star hole, "as bigge as may conteyne a great pinne," and the other, the sun hole, "so subtile and small as a fyne sowyng needle." These were aligned so that a line of sight through them was parallel to the line between the two pointers of the alidade.

Because the suspension ring, even when fitted very loosely, had some friction, early mariners recommended suspending the astrolabe "by a thread or lyne." (This difficulty was, of course, less with astrolabes having chain suspension.) In order to measure the angular elevation of any celestial object except the sun above the horizon, the astrolabe was suspended (by string or chain) so that it hung vertically, much like a plumb bob; the alidade was rotated about its pivot until the star could be seen through the "greate holes;" and the angle of elevation was then read at the pointer of the alidade adjacent to the graduated quadrant. (The angle indicated in Fig. 1 is 32°.)

To obtain higher accuracy, a few astronomers, and a very few mariners, rotated the alidade 180 degrees, and repeated the observation. The two values so obtained were then averaged, in an effort (sometimes successful) to secure a more accurate value. Similarly, when two quadrants of the astrolabe were graduated, a few careful workers repeated their measurements, using first one quadrant, and

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[23] *A Treatise on the Astrolabe* (1391). This was many times reprinted, after its first printing in London by Wm. Thynne in 1532. An excellent modern version is contained in Volume Five of R. T. Gunther's *Early Science in Oxford* (Oxford U. Press, 1929).

then the other, in the belief that the average value would be more accurate than any single value. Although these refined methods are mathematically sound, they were not very much used, as they involved the complicated processes of addition and division, which were difficult for mariners who had trouble counting above ten without taking off their sea-boots.

Measurement of the angular elevation of the sun, or, as it was more commonly stated, its altitude, was performed in a different manner, as the sun cannot be directly viewed many times without permanent ocular damage. A method of doing this, dated 1545, follows:

> To take the altitude of the Sunne, hange up the Astrolabe by the rynge: and set the Aluidada against the Sunne. And rayse it or put it downe in the quarter that is graduate, untyll the beames of the Sunne enter in by the lyttle hole of the tablet or raysed plate, and precysely by the other lyttle hole of the other tablet. Then looke uppon the lyne of consydence. And howe manye degrees it sheweth in the quarter that is graduate (beginnynge fro the horizontall lyne) so many degrees of height hath the Sunne....[24]

Although these instructions are approximately 400 years old, they are still valid today, and would apply quite well to the use of a modern pendulum clinometer or bubble sextant. In a modern handbook, we would modernize the spelling a bit, substituting our modern "madde consystencie" for the archaic forms.

The latitude of any point on the earth's surface is defined as the angular distance of that point from the equator. By modern convention, the latitude of the equator is zero, that of the poles is 90 degrees, the arithmetical sign of latitudes north of the equator is positive (+), and that of points south of the equator is negative (−). Although Kino used these conventions, they were not universally accepted until the beginning of the nineteenth century, so that some old maps list latitudes as measured from "el polo del Norte," or "el polo Boreal." We now call such designations co-latitudes, and the change from co-latitude to latitude is made by substracting the co-latitude from 90 degrees.

Perhaps the earliest method of determining latitude was by measuring the angular elevation of the pole star, which gave an approximate latitude directly. This method was crudely satisfactory in high

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[24] From Martin Curtes, *The Arte of Nauigation* – "Translated out of Spanyshe into Englyshe by Richard Eden, 1561."

and middle latitudes, marginally useful in low north latitudes, and useless south of the equator, where Polaris could not be seen.

If we assume, as did the earliest navigators, that the pole star, Polaris, is always directly overhead at the north pole, and that it is infinitely distant, then it should be, and approximately is, on the horizon at the equator. At intermediate points on the earth's surface, the angular elevation of Polaris should be the latitude. As long as measurements were relatively crude, so that the elevation of Polaris was expressed in "fingers above the horizon," this method works well. Fifteenth-century navigators using it usually made landfall within a hundred leagues or so, north or south, of this desired destination.

Early astronomers, perhaps during the time of the Ptolemies, found that Polaris was not exactly over the pole, but revolved about the celestial pole (the infinite extension of the earth's axis), so that the elevation of Polaris was not always a true indicator of latitude. In 1000 A.D. Polaris was about 7 degrees from the celestial pole, this distance reducing to 3½ degrees by about 1500, 2 degrees in 1700, and about 55 minutes today. This change is due in large part to the precession of the equinoxes, which run a full cycle in about 26,000 years.

Early mariners were aware that something was amiss with their computations, but found that latitudes taken by the pole star method were consistent if the observations were made when the "Guardes" (such as the star *Kochab,* in *Ursa Minor*) were always in the same position. By the mid fifteenth century, this knowledge was organized into the "Rule of the North Star," so that substantially correct latitudes could be measured by Polaris observations at any time that Polaris was visible, and a number of ingenious mechanical devices were available to correct for the difference between the elevation of Polaris and that of the celestial pole.[25] With improved instruments and information, this method is still useful today,[26] particularly in "survival navigation."

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[25] See D. W. Waters, *The Art of Navigation in England in Elizabethan and Early Stuart Times* (Yale U. Press, 1958). Consult Waters' internal index under "Regiment of the North Star."

[26] See Ives, "Atemporal Polaris Correction," *Economic Geology,* v. 53 (1948), pp. 419–426; Ives, "Latitude Determination Without a Sextant," *School Science and Mathematics,* v. 48 (1948), pp. 441–445.

The other effective early method of determining latitude was by measuring the meridian altitude of the sun. This method depends for its operation on several fundamental relations in the solar system. The intersection of a plane through the earth's axis and any surface point is a north-south line, called the local meridian. When the sun is observed to be on the local meridian, it is local noon, and the sun is at its maximum elevation for that day.

Twice each year, at the equinoxes, which occur about March 22 and September 22, the noon sun is directly overhead at the equator and the elevation of the noon sun is the co-latitude of the point from which it is measured. At all other times, because the plane of the equator is inclined about 23½ degrees to the plane of the earth's orbit (the ecliptic), the noon sun is not directly overhead at the equator, and the observed meridian altitude is not the true co-latitude of the point of observation.

Because all major motions in the solar system are regular and systematic, the angular difference between the solar meridian altitude at any point and the co-latitude of that same point, known as the sun's *declination,* can be computed in advance for any day. These corrections were first systematized by the Jewish astronomer, Zacuto of Salamanca, about 1475. After simplification for navigational use by a commission under King John II of Portugal, these tabulated corrections, in various forms, and under various titles, became a permanent part of every navigator's armamentarium. Known in Elizabethan times as "The Regiment of the Sun," and included in Aigenler's *Tables,*[27] they today form an important part of the Nautical Almanacs published annually by all major maritime nations.

Measurement of the latitude by the meridian altitude method, on any clear day of known date, using an astrolabe (or equivalent instrument), and having available a table of solar declinations, is a relatively simple process. The angular altitude of the noon sun is measured with the astrolabe. To it is applied the declination correction for the date. The result is the co-latitude. Subtraction of this from 90° gives the latitude. If local noon is certainly known, or if true south is determined in advance of the observation, only a single "shot of the sun" is

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[27] *Tabula Geographic-Horologa Universalis,* p. 19.

required. If noon is not certainly known, or if the direction of true (not magnetic) south is uncertain, successive observations are taken, beginning shortly before noon, and continued until the solar elevation stops increasing. The time of maximum solar elevation is local noon, and the direction of maximum solar elevation is true south, in the northern hemisphere.

Most fortunately, this method of latitude determination is not only simple, but also insensitive to minor errors of time, direction, or date. At and near local noon, the angular elevation of the sun changes very slowly, as in Fig. 2, so that a small error in the timing or direction of the sun sight produces an even smaller error in the co-latitude measurement.

Because the solar declination takes 182½ days to make its cyclic change of 47 degrees, average daily change in declination is only about 15½ minutes of arc. This means that "missing the date" by one day will produce an error of about 15 nautical miles in the north-south position. This will be somewhat more at the equinoxes, when the declination changes rapidly, and less at the solstices, when declination change is slow, but the error from this cause will never be as much as a day's walk, and hence usually the true position will be within "sight distance" of the supposed position, erroneously determined.

An astronomer or navigator will point out, correctly, that the usual tables of solar declination are correct only for a single meridian – that for which they were computed – so that an error in longitude determination will result in an erroneous declination correction, and hence in a wrong latitude computation. This is a pertinent objection, as we know that Kino's longitude determinations leave much to be desired.

Numerical evaluation of this error shows that if the longitude is "off" by fifteen degrees (about 900 miles at the equator), the declination error will be about 1/24 of the interdiurnal change, or approximately 34 seconds of arc. This averages out to about 3,400 feet – little more than the traditional "arquebus shot"!

In his memoirs, Father Kino clearly describes how he measured latitudes:

> At midday [March 3, 1702] we took the altitude of the sun with the astrolabe, and found it to be fifty-two degrees, which, adding to it the six and a half of south declination of that day, made fifty-eight degrees and a half.

> The complement to ninety degrees is thirty-one degrees and a half, and this was the . . . geographical latitude in which we found ourselves.[28]

This is a succinct description of the determination of latitude by the meridian altitude method. The declination for the day was obtained from Aigenler's handbook, which Kino brought with him "to the Indes and even to these now conversions." The important "Tabella Declinationum Solis ab Æquatore" is contained in this manual.[29]

From Kino's own writings, confirmed in large part by Manje's diaries,[30] we know that the latitudes shown on his maps were instrumentally determined, by the sound and practicable meridian altitude method. We also know that Kino's instrument was an astrolabe, and that he found his declination corrections in Aigenler's Tables, which are substantially correct.

A detailed study of the latitude errors in Kino's maps, reported elsewhere,[31] shows that Kino's astrolabe, which probably was not over 12 inches in diameter, had an index error of perhaps 11 minutes of arc around the 60-degree point. This small an index error indicates that it was a good instrument, well cared for. The mean deviation of all latitude observations attributed to Kino, which can be checked against modern geodetic observations, is 9.09 minutes of arc (read this "about 9 minutes," as the 0.09 given by the computations is probably without significance), which amounts to an error of only about 1/60th of an inch on a 12-inch astrolabe! Few skilled observers, either in 1700 or today, could consistently do as well!

The longitude of any point on earth is the angular distance, measured at the equator, between the meridian through that point and the index meridian. Today, by international agreement, we use the meridian of Greenwich, England, as the index (or prime) meridian, and describe longitude in angular degrees east or west of Greenwich. In Kino's time, there was less agreement among nations, but many Spanish maps used the meridian through the "Islands of Dogs" (Canary Islands) as the index, Tanarive (Tenerife) being on the usually-

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[28] Bolton, *Kino's Historical Memoir of Pimería Alta*, p. 341.

[29] Aigenler, *Tabula Geographico-Horologa Universalis*, p. 19.

[30] See Manje, *Unknown Arizona and Sonora*.

[31] Ives, "California no es Ysla . . .," *Records of the American Catholic Historical Society of Philadelphia*, v. 64 (1953), pp. 189–198.

chosen prime meridian. Use of an arbitrarily-chosen and mutually agreed-upon prime meridian is necessary because there is no convenient celestial indicator of the meridian of Greenwich (or any other meridian). This same "Heavenly fault" greatly complicates determination of longitude, particularly at sea, so that there was a lapse of almost 2,000 years between a clear understanding of the problem, and its consistent practical solution.

At some unknown time before the beginning of the Christian Era, Greek astrologers and navigators became aware that each difference in longitude was related to a difference in time, and were vaguely aware that if the time difference between two places could be learned, the longitude difference could also be determined. Although the Greek ideas seem quite rational (even though our information is largely based on copies of copies of copies of the original writings, some of them many times translated), the ancients probably could not make effective use of their knowledge, because they lacked effective time measuring devices. In 1522, Gemma Frisius of Louvain, a teacher of Gerald Mercator, clearly stated the longitude problem as follows:

> When the sun is directly overhead at any point on the earth's surface, it is [local] noon at that point, and at all points on the meridian running through it. At any position east of it, toward the sun's rising, it is already past noon; west of it, it is not yet noon. If the difference in time could be found, could not this be used to find the position of these places with reference to one where it was, say, already noon? As the earth in 24 hours rotates through 360°, in one hour it rotates through 15°, in one minute through 15′. Clearly position east and west could be found if time could be accurately measured.[32]

Frisius' pertinent words "If time could be accurately measured" explain why, even though sound methods of longitude determination were surely known to European navigators at least as early as 1522, consistent determinations of longitudes at sea were not possible until after 1761.

The portable timepieces of Frisius' time were accurate to about a quarter of an hour a day, when the temperature was reasonably constant, when the instrument was not jiggled around too much, and when the rest of the mechanism was working approximately right.

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[32] Explained fully in William Cunningham, *The Cosmographical Glasse* . . . (London, 1559).

Such an error would lead to a distance error of more than 200 nautical miles, at the equator, if the time indications were used in navigational computations. The other time determiner of Frisius' time was an hour glass, which, if carefully used, was about as accurate as the "Nurmberg Egg", provided "Ye dampenesse of ye sea" did not enter to slow the sand. Although some of the ship's hour-glasses were sealed with "waxe," to exclude moisture, the trouble continued in cold weather. Apparently condensation was not understood in the sixteenth century Because there were neither suitable portable timekeeping devices (the Harrison chronometers wer not proof-tested until 1761) nor radio time signals (1905 on), seventeenth-century navigators used, or tried to use, various astronomical occurrences, such as eclipses and occulations, to determine local index meridians; and used various methods of departures for day-to-day longitude determinations. Although many of these methods, such as Herne's *Method of Lunars* (*ca.* 1678), were brilliantly conceived, their application was too difficult for the average navigator, so that attainable accuracy tended to be low, and the methods were rapidly supplanted by others, made feasible by John Harrison's development of the modern marine chronometer.[33]

The only archaic method of longitude determination meriting consideration here is that involving simultaneous observations of lunar eclipses. Such observations were attempted by Columbus, on his voyages of 1484 and 1504, with somewhat less than satisfactory results, due in large part to inaccurate tables. Lunar eclipse observations were

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[33] John Harrison (1693–1776), a carpenter by trade, almost single-handedly developed the automatic temperature compensation for chronometers, making them sufficiently dependable for use in navigation. As early as 1726 he demonstrated the "gridiron pendulum" for clocks, a device which made their rate independent of temperature. Later, with the promised backing of the British "Commission for the Discovery of Longitude at Sea," he developed and perfected similar temperature compensators for marine chronometers. Finally, in 1761–1762, he produced a marine chronometer consistently accurate to better than 0.8 seconds per day, as demonstrated on a voyage from England to Jamaica (147 days). Similar accuracy was demonstrated on the return voyage; and on a later test, the accuracy was almost doubled. Although these tests proved that the chronometer, as improved by Harrison, more than met the requisite specifications, the Royal Commission did not pay him in full until eleven years later – in 1773. The modern marine chronometer differs little in fundamental design from Harrison's, and is one of the most dependable scientific instruments known.

specifically mentioned in the *Rudo Ensayo*,[34] also with unhappy results, this time due to an Indian revolt. The fundamental method of "Telling Longitude from Eclipses" is clearly outlined in a treatise (*ca.* 1271) of Robertus Anglicus.[35] There is no assurance that the method was original with him; and much vague evidence suggests that the general principles were known considerably more than 1,000 years previously.

Throughout its area of visibility (approximately an entire terrestrial hemisphere), a lunar eclipse occurs at the same instant of cosmic time, however we may define or measure it. The local time of the eclipse, however, will be different at different points (not on the same meridian), because local time is a function of longitude. In consequence, if the local time[36] of the eclipse is noted at two points, the difference between the noted times is a measure of the difference in longitudes. This may be evaluated by multiplying the time difference in hours (and fractions) by 15, giving the difference in degrees (and fractions), because the earth rotates 15 degrees on its axis during each hour of time.

An eclipse of the moon occurs whenever the moon passes through the earth's shadow in space. In natural consequence, lunar eclipses are visible only from the night side of the earth, and these eclipses occur only at the time of full moon. They do not occur at every full moon because the plane of the moon's orbit is inclined to the plane of the earth's orbit (Ecliptic) by about 5 degrees, 9 minutes. The full moon, in many instances, is outside of the earth's shadow.

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[34] Trans. and ed. Eusebio Guiteras, *Records of the American Catholic Historical Society of Philadelphia*, v. 5 (1894), pp. 117–118. The context here seems to be somewhat confused. Available records show no lunar eclipse in 1751 which could be observed in both Sonora and Tenerife. However, an astronomically useful total eclipse of the Moon (Oppolzer #4574), having a mid-totality at Tenerife (Long. 16° 20'W.) at about 0038 local time, December 13, 1750, and mid-totality in Sonora (110°W.) at about 18:23 local time, December 12, 1750, seems to meet all requirements, and may be the one referred to. Finding of the missing records referred to would permit a most interesting recomputation of the data, and a clarification of the *Rudo Ensayo* text at this point.

[35] *Commentary* [on *The Sphere of Sacrobosco*], Lectio XV: "Item sciendum quod per eclipsim potest homo certissime scire longitudinem civitatis. . . ." Cf. Lynn Thorndike, *The Sphere of Sacrobosco and its Commentators* (U. of Chicago Press, 1949), pp. 244–245. (I am indebted to Mr. Roberrt J. Drake, of Vancouver, B.C., for calling attention to this most interesting work.)

[36] That is to say, local *sun* time – not local zone time.

Because the earth's shadow is complex, and the path of the moon through and near it varies systematically, there are several types of eclipses. Earth's shadow in space is bipartite, consisting of an outer half-shadow (penumbra) and an inner (nearly) complete shadow (umbra). Shadow relations are shown in Fig. 3A.

When the moon passes partly or wholly through the penumbra, a partial or total enumbral eclipse occurs. These are somewhat difficult to detect in the field, and are seldom used for navigational purposes. When the moon passes partially or wholly through the main shadow of the earth, a partial or total umbral eclipse occurs. These are what is commonly known as partial or total eclipses of the moon.

Duration of an (umbral) eclipse may vary from a few seconds in the case of a partial eclipse to more than two hours for a total eclipse. In consequence, determination of the same instant in an eclipse may be somewhat difficult, and observers have found that use of several identifiable positions of the moon with respect to the earth's shadow facilitates observations. These positions are called "contacts" and are numbered as in Fig. 3B, position number one being called "First contact," etc. Times of contacts are rather easily determined, requiring only a single observation. Time of midtotality is more difficult to ascertain, requiring two observations and a computation. It may not be feasible to make the two requisite observations (times of contacts 1 and 4, or 2 and 3) in bad weather.

Because the orbit of the moon about earth, and the orbit of the earth about the sun, are both stable, we can predict, by rigorous mathematical methods, when eclipses will occur, and when they will be visible. One such table of predictions, Ritter von Oppolzer's *Canon der Finsternisse*,[37] gives the date, time, duration, and geographical position of every (umbral) lunar eclipse from 1206 B.C. to 2163 A.D. – 5,200 eclipses in all.[38] Sun-earth-moon relations during an eclipse are shown in Fig. 4A; systemic relations not leading to an eclipse are shown in Fig. 4B and 4C.

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[37] (Vienna: *Akademie der Wissenschaften*, 1887), pp. 325–376. (I am indebted to the U.S. Naval Observatory, Washington, D.C., and to the Lick Observatory, Mt. Hamilton, California, for eclipse references and information.)

[38] See Alexander Pogo, "Additions and Corrections to Oppolzer's Canon der Mondfinsternisse," *Astronomical Journal*, No. 1083 (February 1938).

From this information, which was perhaps 1,500 years in gestation, navigators were able, on occasion, to determine longitudes with some accuracy. After 1700, when improved "tables of lunars" became available, including not only eclipses, but also occulations of stars and planets by the moon, use of "lunars" was a standard navigational procedure. Wide adoption of the marine chronometer made simpler methods possible by about 1850; and these methods, augmented by radio time signals, with received accuracy better than 0.1 second of time, are now adequate for most terrestrial navigation problems.

Because Father Kino undeniably had sufficient astronomical and mathematical knowledge and skill to make use of lunar eclipses as a method of determining longitudes; and because he might have brought or else constructed adequate timekeeping equipment to apply the method, a search was made of the astronomical tables and the historical records, to determine just what eclipses were available to Kino, and what use, if any, he made of them.

During the time that Father Kino was actively working in Sonora (1685–1711) there were forty-three lunar eclipses, according to the aforementioned "Canon der Finsternisse" a table which is known to be not quite perfect, but extremely good.[39] Of these umbral eclipses, twenty-six were partial, and seventeen total.

Now, for an eclipse to be navigationally useful, it must be visible not only at the point of interest (Dolores), but also at an index point (here taken as Tenerife). This requires that the geographical position of the eclipse (the point where it is directly overhead at totality) be between 20 degrees west of Greenwich and 106 degrees wst of Greenwich. All other eclipses, no matter how spectacular, are of no value in this case.

Meeting these conditions, during the period under consideration, are nine umbral eclipses, five total and four partial. Pertinent data on these are contained in Table *infra,* which is derived from that in the "Canon der Finsternisse," with Dolores date and Dolores Local Time added for convenience.

The first eclipse, No. 4475, occurred at Dolores on September 28, 1689, and was a total eclipse, with totality beginning just after

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[39] No errors of importance during the period of our interest (1685–1711) have been reported.

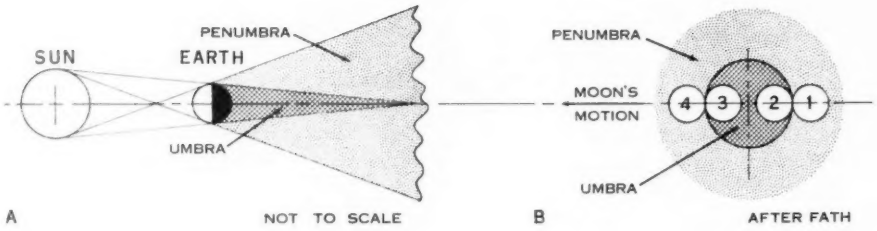

Fig. 3. A. Shadow formation in space. B. Parts of eclipse.

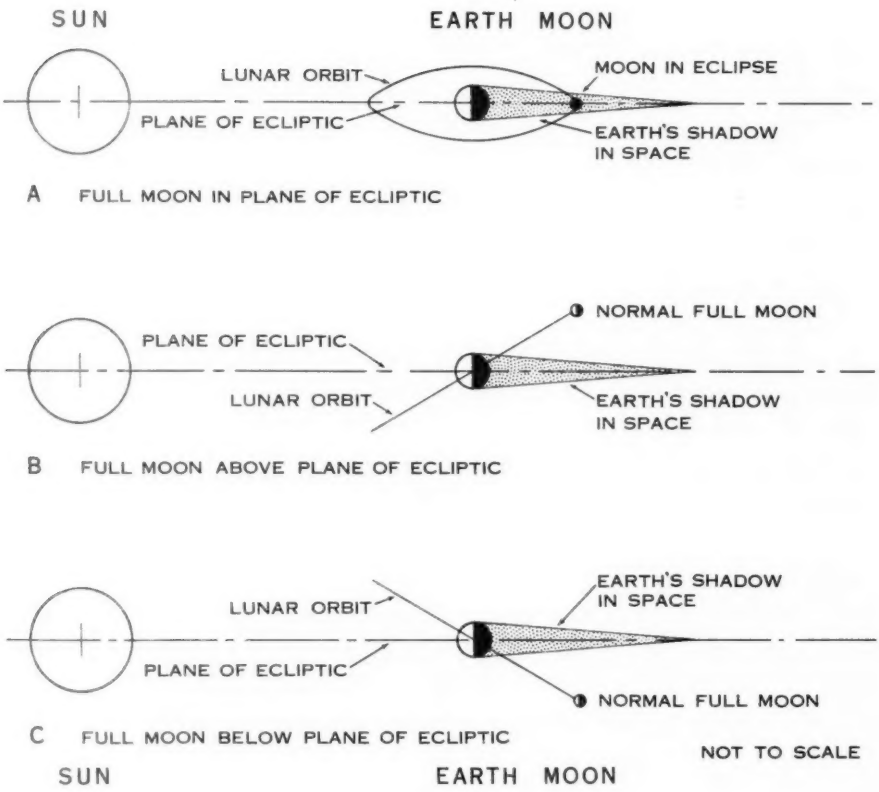

Fig. 4. Eclipse relations.

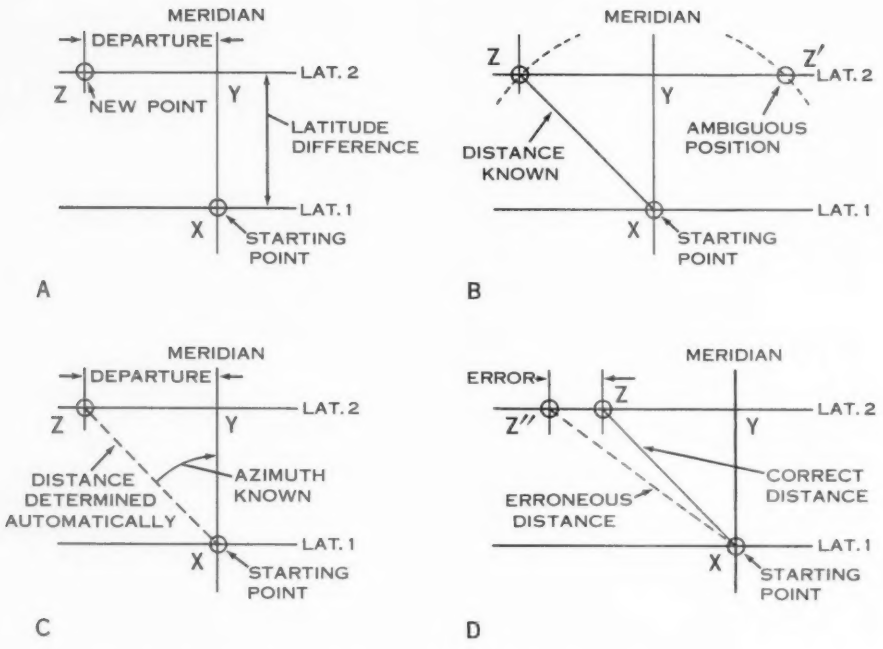

Fig. 5. Applications of the method of latitudes and departures.

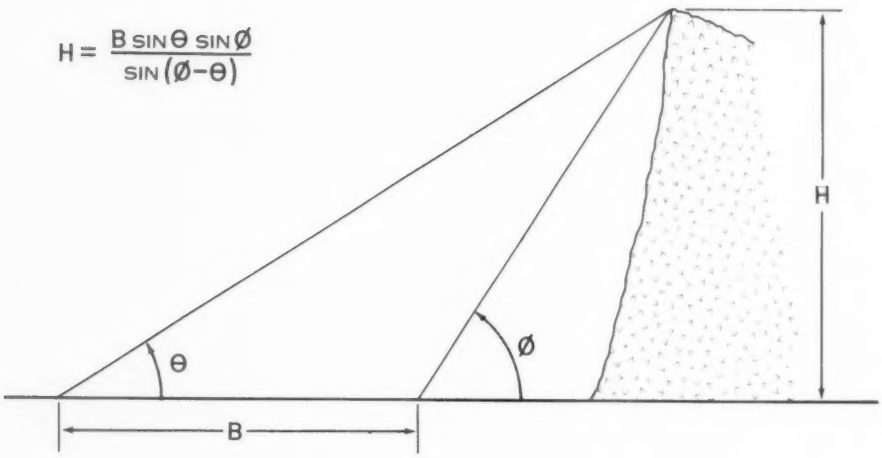

Fig. 6. Determination of the height of an object when the base is inaccessible.

No.*	Greenwich Date	GMT†	Half Duration Minutes Partial	Total	Long.	Dolores Date	DLT§
4475	Sept. 25, 1689	0221	112	51	38°W.	Sept. 28	1858
4479	Aug. 28, 1692	0310	46	—	46°W.	Aug. 27	1947
4480	Jan. 22, 1693	0400	111	50	57°W.	Jan. 21	2037
4487	Nov. 9, 1696	0429	112	52	71°W.	Nov. 8	2106
4488	May 6, 1697	0544	74	—	87°W.	May 5	2221
4498	Dec. 23, 1703	0629	112	51	98°W.	Dec. 22	2306
4501	Apr. 28, 1706	0133	74	—	24°W.	Apr. 27	1810
4503	Apr. 17, 1707	0142	112	52	26°W.	Apr. 16	1809
4505	Apr. 5, 1708	0539	76	—	84°W.	Apr. 4	2216

* No. is that listed in "Canon der Finsternisse"
† GMT is Greenwich Mean Time
§ DLT is Dolores Local Time

sunset, and ending 102 minutes later, approximately. Kino at this time was at or near Dolores, and no mention of the eclipse is found in available documents.

The second eclipse, No. 4479, occurred at Dolores on August 28, 1692, and was partial, beginning at about seven in the evening, and ending about 1½ hours later. At this time, Kino was journeying northward, through the country of the Sobaipuris, and had no facilities for longitude observations on the trail.[40]

The third eclipse, No. 4480, occurred at Dolores on Jan. 21, 1693, at about half past eight, Dolores time, in the evening. This was a total eclipse, and ideally suited for longitude observations. At this time, Kino was busy preparing his new church at Dolores for dedication, and makes no mention of the eclipse. Was it, perhaps, cloudy on the evening of January 21, 1693?

The fourth eclipse, No. 4487, occurred at Dolores in mid-evening of November 8, 1696, and was a total eclipse, ideally suited for the desired longitude observations. At this time, Kino was at Dolores, preparing for his horseback trip to Mexico City, which began on November 16. There seems to be no documentary record of this eclipse in Sonora.

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[40] We have no evidence suggesting that Kino possessed a portable timepiece.

The fifth eclipse, No. 4488, occurred at Dolores on May 5, 1697, between 2117 and 2335, local time. This was a partial eclipse, of dubious navigational utility. At this time, Kino was probably at Dolores, resting between trips.

The sixth eclipse, No. 4498, occurred at Dolores on December 22, 1703, about one hour before local midnight. This was a total eclipse, with totality lasting about one hour and forty-two minutes. At this time, Kino was in the vicinity of Dolores, preparing for the coming of the long-hoped-for additional missionary, Father Geronimo Minutuli, who was assigned to Tubutama. Again, contemporary documents contain no mention of an eclipse.

The seventh and eighth eclipses, No. 4501, of April 27, 1706, and No. 4502, of April 16, 1707, occurred at Dolores just about sunset, and were over before full darkness set in. As, in each instance, the moon rose in eclipse from behind the Sierra de Santa Rosalia, it is doubtful that either eclipse was observed at Dolores; and improbable that such an observation, if made, would have been navigationally useful.

The ninth and last eclipse, No. 4505, occurred at Dolores at about quarter after ten, local time, on April 4, 1708. This was a partial eclipse, of short duration. At this time, Kino was apparently at Dolores, apparently working on the final chapters of his *Favores Celestiales*, "in addition to his regular duties."

From the foregoing, it appears that Kino made no navigational use of lunar eclipses, and apparently also made no mention of them in his currently available writings. In fact, the only mention of eclipses in Sonoran documents of that time seems to have been made by Manje.[41] We also find no clear evidence that Kino ever had a table of eclipses; and there is no contemporary reference to any of the time-keeping devices (clocks, watches) which are essential for effective use of eclipse observations. It is almost certain that some of the eclipses listed in Table I were not visible because of cloudiness; but it is unlikely that all of them were so concealed.

Because of the near impossibility of measuring longitudes with any certainty, navigators in the seventeenth and eighteenth centuries

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[41] See Manje, *Unknown Arizona and Sonora*, p. 244: "When . . . there is an eclipse of the sun and moon they all yell. . . ."

developed a method known as *departures*. Coupled with measurement of latitude, this method permitted exact location of a point, and land surveyors, to this day, make location designations by the method of *latitudes and departures,* applied either graphically, as did Kino, or mathematically, as became the accepted method when good trig tables were generally available and understood.

Given a starting point whose location is known by latitude and longitude (or otherwise) and a new point whose relative location is to be determined, the new point can be located rigorously by the method of latitudes and departures. The simplest method is to proceed along the meridian of the starting point until the latitude of the new point is reached. The travel in this direction is the latitude difference of the new point relative to the starting point. Next one proceeds along the parallel (of latitude) of the new point until it is reached. Distance travelled from the meridian of the starting point to the meridian of the new point is the departure of the new point (relative to the starting point). This elementary approach to the problem, outlined in Fig. 5A, is much like the "constant latitude sailing" common in Kino's day and earlier. Distances were usually measured in leagues, kennings, or sea miles, and later converted to degrees, minutes and (sometimes) seconds, by tabular or graphical methods. William Bourne, as early as 1574,[42] depicted an entirely workable device for ascertaining "how many miles there are in a degree of longitude in any given latitude."

From Kino's own diaries we know that he did not make doglegs all over Iitoi's domain, but that he travelled directly from point to point. We also know beyond any doubt that he was in the habit of determining latitudes by astronomical measurements to an accuracy which was remarkably good at the contemporary state of the navigator's art. In consequence, he had available two possible *modi operandi,* in applying the method of latitudes and departures.

Location of a new point, by latitude and departure, with the latitudes known, and the distance also known, is done graphically by straightforward means. The two parallels of latitude are drawn on the

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[42] *A Regiment for the Sea* . . . (London, 1574, 1577, 1580, 1592). There also exist several pirated and plagiarized partial versions.

paper to any desired scale, and are intersected at right angles by the meridian of the starting point. Then, with the starting point (X in Fig. 5B) as a center, and the distance (to scale) as a radius, an arc is drawn, intersecting the parallel (of latitude) through the new point at Z and Z′. This determines two equal departures, Z–Y and Z′–Y, one of which is ambiguous. The undesired ambiguity is eliminated if the approximate bearing of the course X–Y is known, and the construction (after eliminating the ambiguity) automatically determines the azimuth of the course (X–Z). This is a geometrically valid determination because "two right triangles are congruent if the hypotenuse and a side of one are equal respectively to the hypotenuse and a side of the other."[43]

The new point can also be located accurately, the respective latitudes being known, if the azimuth of the course (X–Z in Fig. 5C) is known. With the same initial construction as previously, the course is laid off from the starting point, with the requisite azimuth. Intersection of the course line with the latitude of the new point locates the new point (Z), and automatically determines the distance (X–Z). This is a geometrically valid determination because "two triangles are congruent if two angles and the included side of one are equal respectively to two angles and the included side of the other."[44] As should be obvious, the intersection of a meridian and a parallel (of latitude) is always a right angle ZYX, any part of Fig. 5).

In the hilly Sonoran environment, where "straight sights" from starting point to destination are frequently impossible, the first method (Fig. 5B), employing (in addition to latitude measurements) distance and approximate direction, is likely to be the most useful. The azimuth method (Fig. 5C), useful only where "straight sights" are possible, is less applicable here. It requires, for effective use, a sighting compass calibrated in degrees (which Kino apparently did not have) and correction for local magnetic variation, by Polaris sight or other method. The azimuth method is also vulnerable to local magnetic attractions, which are numerous in the volcanic areas west of Sonoyta,

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[43] George Wentworth and D. E. Smith, *Plane Geometry* (New York: Ginn & Company, 1938), p. 43.

[44] *Ibid.*, p. 30.

and in some placer regions, such as Puerto del Humo, where black magnetite sands are naturally concentrated.

Because both methods employ plane geometry and the earth's surface is curved, a small curvature error will be present in all such measurements. As the curvature error is considerably smaller than the other unavoidable errors in Kino's maps, it is of only academic interest here.

From Kino's own writings, and from those of his companions on the trail, we know not only that he measured latitudes, but also the exact method that he used. These same sources tell us that Kino also made all necessary measurements for mapping by the "distance" method. His diary entries of these facts are commonly as follows: "On October 3 . . . we set out for the west . . . after a journey of six leagues . . . we arrived at . . . Guoydag. . . . After going seven leagues more, we reached San Mateo del Batki."[45] The essential data here are "thirteen leagues" and "west".

Had the azimuth method been used, Kino would have had to report the same travel substantially as follows: "From El Tutto, we took a course south 82 degrees west to San Mateo del Batki." Kino made no such detailed directional observations, nor did Manje, his field companion on many expeditions. Both men commonly cited directions only to the nearest octant, and neither used the infrasedecimal compass divisions essential for effective use of the azimuth method.

The mean error of Kino's distance citations is about five per cent. Manje's cited distances, in general, exceed Kino's, but not by a fixed percentage. Comparison of cited travel distances suggests that Manje's figures approximate the distance actually travelled, whereas Kino's figures approximate the airline distance between points. So far as we can now determine, both men estimated the distance travelled. It is certain that, on many journeys, they did not have a corporal assigned to count paces, four thousand of which made one league.

Because the latitudes in Kino's maps were instrumentally measured, with relatively high precision, while the departures were determined from estimated distances, which had a relatively lower pre-

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[45] Bolton, *Kino's Historical Memoir of Pimería Alta*, pp. 246–247.

cision, lateral distortion of Kino's maps is to be expected. How this comes about is diagrammed in Fig. 5D, which shows the production of an error of departure by geometrical determination involving an error of distance estimation. It should be noted that the percentage error of departure is greatest when the course between points is nearly meridional, and least when the course is lateral.

Inspection of Kino's maps will show immediately that the longitudes are quite erroneous. Correction of the stated longitudes from the meridian of Tenerife to the present index meridian of Greenwich improves the numerical values somewhat, but leaves them still quite definitely wrong. This is due entirely to Kino's inability to measure longitudes. Not having a suitable local index of longitude, and also lacking instruments and tables sufficient for eclipse observations, he was forced to operate from a "guessed meridian" (perhaps that through Mission Dolores). Taking this difficulty into account, we find that Kino's maps are laudably self-consistent, and probably as good as the state of the cartographer's art in 1700, skilfully applied, would permit. It is noteworthy that Sonoran longitudes were still undefined in 1751, that a few key points were accurately located by the boundary and railroad surveys just after the American Civil War, and that many points in western Sonora were not accurately located until the field notes of Lumholtz and Celaya were drawn up by A. Briesemeister in 1912.[46]

Modern maps customarily locate points on the earth's surface by latitude, longitude, and altitude, usually in a form similar to the familiar U.S.G.S. "Quad" maps. Reference to the map accompanying this article will show that Kino proceeded similarly, but that the altitude indications are qualitative only. We do not know, from Kino's maps, whether the various sierras are 100 feet high, or 10,000, and we can judge the slopes of the flatlands only from the directions of flow of the rivers.

This "deficiency" in Kino's maps is more apparent than real, and it detracts not at all from their primary usefulness – showing where places are. Several million maps, constructed on about the same plan as Kino's, are published annually in the United States – we call them

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[46] I am indebted to Mr. Alberto Celaya, of Sonoyta, Sonora, and to Mr. William Briesemeister, of the American Geographical Society of New York for helpful discussions of the making of the Lumholtz maps.

road maps. For most purposes, specifically including trail and highway travel, the detailed contours of the "Geological Survey" map are of very little use, and are better omitted for the sake of clarity.

Methods of determining altitude in Kino's time were few, and quite difficult to use. The laborious rod-and-level method, used in the time of the Pharaohs, was the best for gentle slopes. Equipment for this method consists of a levelling device and one or more calibrated rods. In ancient times, the level consisted of an open sight alidade floated in a dish of water, mercury, or honey. As the liquid surface was always level, so (it was hoped) was the alidade. In operation, the rod was placed on the index point, the level set up at a convenient location, and the calibration of the rod, seen through the alidade, was noted. The rod was then moved to a second point, the process repeated, and the difference in elevation computed by subtracting the second reading from the first. This could be repeated, using the second point as the index for another setup, and so on, util the "line of levels" was completed.

According to a hoary piece of engineering folklore, this method was used by a group of Romans, who were hired by Cleopatra to dig a canal from the Nile to the Red Sea. The figures, on completion of the survey, showed that the Red Sea was nine cubits higher than the Nile. Obviously, digging the canal would flood the Mediterranean basin, imperilling Imperial Rome. Quietly, the Romans consigned the project to Tartarus, and took their tripods, dishes, alidades and rods to more friendly climes.

Today, although we use telescopic levels and accurately calibrated rods, correct for atmospheric retraction, and although we guard against shimmering of the air by working at odd hours, the fundamental method is the same as in the time of the Caesars. No record has been found, however, to show that this rod-and-level method was used in Sonora during Jesuit times, and no reference to the requisite equipment has been found in any mission document studied. The most useful method of height determination, in Kino's time, was vertical angulation, a method still widely and effectively used. In its simplest form, vertical angulation was understood, and probably used, before the time of Alexander the Great.

To determine the height of a tower or cliff, when the base is accessible, the angle of elevation of the summit from a convenient

place is measured; then the distance is measured from the point of observation to the base. Height is then determinable by means of a scale drawing, or can be computed from the formula "Height = base distance X tangent of angle of elevation." Field workers, anxious to save time, early found that if the angle of elevation was 45 degrees, the height equalled the distance; and if it was 26⅓ degrees (approximately), the height was half the base distance.

At least 1,000 years ago, some unknown genius, possibly in Persia, designed an astrolabe with which angles of elevation could be measured, and the height of an object, the base distance being known, determined rapidly, without the use of tables or computations. This improvement consisted of rectangularly cross-hatching one quadrant of the astrolabe, so that the alidade, at any setting, made a family of proportional right triangles in that quadrant. The number of units of length in the base line was then counted off along the horizontal line of the astrolabe, and the height of the object, in the same units, was then given directly above it. Surviving astrolabes, suitably calibrated for this use, include that of Ahmad and Mahmud, sons of Ibrahim, makers of astrolabes, natives of Isfahan, dated A. H. 374 (984 A.D.).[47] Construction of astrolabes of this type continued into the nineteenth century, one of the best surviving later examples being an instrument "made by order of Mahmud Mirza Kajary Said – son of the greatest Shah in the Paradise-like city of Naharwand" by "this slave Mohammed Akhbar" in A.H. 1234 (A.D. 1818).[49] Study of the workmanship on this device indicates beyond question that "this slave Mohammed Akhbar" was a first-rate instrument maker.

When the height of an inaccessible object is to be determined, the measurements and computations are somewhat more difficult, but means for determining such altitudes accurately have been known for considerably more than 400 years. To make this measurement, one determines the angle of elevation of the summit from a convenient distant point; then moves a known distance toward the object; and again de-

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[47] See Gunther, *Astrolabes of the World*, v. 1, pp. 114–116, and pls. XXII and XXIII.

[48] See *ibid.*, v. 1, pp. 151–153; pl. XXXVII; and figs. 73, 74, and 75.

[49] See *ibid.*, v. 1, pp. 169–170; pl. XLIV; and fig. 83.

termines the angle of elevation of the summit. Geometry for making this measurement is shown in Fig. 6, along with the formula for computing the height. Here B is the measured base distance; θ is the first angle measured; and ϕ is the second angle. H is the height of the object, to be determined.[50]

We can be certain that these methods were known in Kino's time, for they are clearly depicted in Johan Stöffler's widely reprinted and pirated book *Elucidatio fabricae ususque astrolabii,*[51] first published in 1512.

Mathematical tables more than adequate for these and similar trigonometric computations were widely circulated through the publications of Regiomontanus, otherwise known as Johannes Muller of Konigsburg, after 1490. Where accuracy to only two figures was required, as in most field work, the requisite sine functions could be read directly from the sine quadrants of many astrolabes, making a book of tables unnecessary.

As might be expected, practical field workers soon found that much computation could be eliminated if two "convenient" angles were used in this height determination. If θ is 30 degrees and ϕ is 45 degrees, the height is 1.3659 times the measured base; and if θ is 30 degrees and ϕ is 53⅓ degrees, the height (very nearly) equals the measured base.

We find no specific references to the use of these methods in Kino's surviving manuscripts, or in Manje's diaries, but, as they were the only methods available to him, we can be sure that Kino used them on occasion, probably during the layout of his mission sites, if for no other purpose.

It has been pointed out on several occasions that Kino could perhaps have measured altitudes barometrically, as the mercurial barometer was invented by Evangelista Toricelli in 1643; and a relation between barometric pressure and altitude was experimentally demonstrated by Blaise Pascal, René Descartes, and Florin Périer about 1648. The results, however, were not published until 1663.

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[50] Derivation given in C. I. Palmer and C. W. Leigh, *Plane and Spherical Trigonometry* (New York: McGraw-Hill, 1934), p. 150 (#5).

[51] (Oppenheym, 1512). Nineteen other editions and translations are known through 1536.

Unfortunately, altitude cannot be determined barometrically unless the local daily barometric cycle is known (requiring a series of long-term observations at a base station) and the air temperature (preferably at both base and advance stations) is also known. These essential measurements could not be made with the requisite accuracy until Gabriel Fahrenheit developed a mercurial thermometer with a rational calibration, in 1714. The first dependable formula relating altitude, atmospheric pressure, and air temperature was developed by Jacques Babinet about 1838. Approximately a century later, the late W. J. Humphreys, using vastly more complete data, was able to improve this formula "after the third significant figure."

Because the mercurial barometer was a most difficult instrument to use effectively in the field, simpler and more portable means for measuring atmospheric pressure ewere searched for, and the ancestor of our modern aneroid barometer was demonstrated by Jacques Conté in 1799. Quantity manufacture of aneroid barometers did not begin until about 1849; and it was not until about 1885 that the instrument was accepted for field use in western North America.

One of the most extensive uses of the mercurial barometer for determining altitudes was that by John Wesley Powell during his explorations of the Colorado canyons in 1869. A parallel method, in which altitude was determined by measuring the boiling point of water, was used with somewhat ambiguous results during the Hayden Surveys of the Territories during the 1870s. This ingenious method of determining altitudes was developed after Fahrenheit's development of a rational thermometer scale (1714), and was supplanted by aneroid observations shortly after 1880. From the foregoing it appears that Kino could not have made any effective determinations of altitude by the barometric method, as the method was not adequately developed in Kino's time; and, no record has been found of the existence of a barometer of any type in Sonora during the early eighteenth century.

The preceding summary history of the development of navigational and cartographic instruments and methods from the time of their introduction to the Christian world until after the close of Kino's career, gives us a good indication of the methods available to him during his explorations of Papaguería and parts of Baja California. Investigation of Kino's educational background shows beyond any reasonable doubt that he was capable of using effectively all mapping techniques available in his time. Diary evidence shows that he prac-

ticed navigation while en route to the New World; and his comet observations evidence creditable astronomical competence.

Scrutiny of contemporary literature, largely Kino's own diaries and reports, gives us specific information concerning the field use of some of these methods, and details the instruments and tables which Kino employed. Clues to the probable use of some other methods are furnished by the types and accuracies of cited geographic facts. Non-employment of several other navigational and cartographic methods is indicated by lack of reference to the data and instrumentation necessary for their use.

From this information we can prepare, with some confidence, an "assayer's report" on the cartographic work of Father Kino. Although the basic data are not, in every instance, as complete as we would like, they appear sufficient to permit a fair appraisal of the work, and they are adequate for the certain elimination of serious anachronisms in the "Herodotus' typewriter" category.

Kino's latitudes were instrumentally measured by the meridian altitude method, by means of an astrolabe for the angular determinations, and of Aigenler's Tables for the declination corrections. No corrections were made for atmospheric refraction, which was neither clearly understood nor accurately evaluated in 1700. Choice of this method was most fortunate, for errors of time, direction and refraction are relatively minor when it is used carefully. The attained accuracy of Kino's latitude measurements is about as great as careful use of the method and instruments permit. A skilled worker, using the same instruments and methods today, would have about the same average error of observation.

Kino's longitudes are all derived figures, and they are all wrong. Kino had no firm index meridian, no method of determining longitudes in the field, and no convenient means of checking his east-west distances, other than estimation. Longitudes in Kino's maps are based on departures, which were determined trigonometrically, using measured latitudes and estimated distances as basic data. Because Kino's distance estimates were good, and his latitude measurements excellent, lateral distortion in his maps is small, and the use of a "floating index" or "guessed meridian" detracts from their practical usefulness not at all. Although longitude determination by lunar eclipse observation was understood in Kino's time, he could not make use of the method, because he had no suitable timekeeping equipment. Although several

suitable eclipses occurred in Sonora during the time of Kino's explorations, no mention has been found of them in available Kino documents.

Kino's altitude designations are qualitative only, and adequate for the purposes of his maps. Although he could have determined the altitudes of the various sierras by vertical angulation, using his astrolabe, he seems not to have done this. Actually, cartographers, prior to about 1750, paid little attention to elevation per se, and the now-familiar contour maps, although invented by the Dutch engineer Cruquius, about 1728, did not become generally available until about 1878, when the original process (contour mapping) was combined with color printing.

So much for the objective portion of the assay. The subjective portion, which is the assayer's opinion, unavoidably is influenced by the assayer's background and experience. The present assayer is a geophysicist by training, and an explorer by avocation. The considered verdict is that Kino's maps are somewhat better than we could reasonably expect, in view of the state of the cartographic art in 1700, the instruments available then, and the time available for the work. One of Kino's maps, the "Passo por Tierra" is probably the most competent one-man exploration ever conducted.

During the course of this study of Kino's maps, and the methods by which they were made, it became apparent that his maps, in some instances, contained more specific information than could be found in surviving diaries and letters. Additionally, some of the parallel documents, such as the Manje diaries, contain references to observations which are not included in available Kino documents.

From these evidential discrepancies, it appears that the Kino documents now available are only a part of the total notes, letters, and diaries written by Kino. Among the documents which should be sought are:

1. One or more tables of locations, listing the names of places visited, their measured latitudes, and their distance from some other place.
2. One or more descriptions of eclipses. Taking into account probable cloudiness on several pertinent occasions, it seems almost certain that Kino witnessed at least two solar and two lunar eclipses during his active field life in Sonora.
3. One or more descriptions of meteor showers.

Additionally, the fate of Kino's copy of Aigenler's *Tabula Geographic-Horologa Universalis* has not been determined. It is barely possible

that this valuable scientific work has survived to this day. If found, it would be worn from a quarter of a century in saddlebags, dog-eared from much use, and stained with the sweat, dust, and mud incident to many thousands of miles of desert travel. Perhaps marginal notes in this work constitute the field notes which we believe must have existed, but which we do not yet possess.

Lastly, a diligent search for Kino's astrolabe should be made. This instrument, made of metal, should be substantially immortal, so that chances of its survival are good. If found, even though not specifically marked, it could be identified by analysis of the metal, and study of the inherent errors in the calibration.

Lest this search be likened to the quest of the Holy Grail, let it be remembered that Drake's "Plate of Brass," nailed to a post on the shore of "New Albion" in June, 1579, was – after suffering various vicissitudes – found in 1936 and, after detailed and critical study with the edged tools of modern science, declared to be "the genuine Drake Plate."[52] Likewise, Champlain's astrolabe, lost on June 7, 1603, was found in August, 1867.[53]

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[52] See Bolton, *Drake's Plate of Brass: Evidence of His Visit to California in 1579* (San Francisco: California Historical Society, 1937); Colin G. Fink, *Drake's Plate of Brass Authenticated* (San Francisco; California Historical Society, 1938).

[53] See A. J. Russell, *Champlain's Astrolabe* (Montreal, 1879).

WILLIAM ANDREWS CLARK
(1839–1925)

Sketch by Joseph Henry Haskins, reproduced by courtesy of William Andrews Clark Memorial Library, University of California, Los Angeles.

WILLIAM ANDREWS CLARK, WESTERNER

AN INTERPRETATIVE VIGNETTE

by

JAMES HIGH

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WILLIAM ANDREWS CLARK (1839–1925) of Montana perhaps typifies the Westerner who followed the pioneers and was able to reap the benefits of the virgin land without experiencing the dangers that beset the first settlers. John M. Bozeman's name is preserved in geography, as is that of the Bannock, the Blackfeet, and the Crow; but Clark's name is preserved in his son's munificent gift to the University of California at Los Angeles: the William Andrews Clark Memorial Library, with its beautiful fumed copper bookcases, its eighteenth-century salon, its "French Room," and its murals and ceilings in the best neoclassical tradition that Montana copper could buy – not to mention the works of art and the priceless collections of rare books and manuscripts concerning Stuart England, the times of Oscar Wilde, and the American West. Clark's oldest son spent well the fruit of his father's labor in the rough environment of frontier Montana, but he spent it as a delettante in settings of luxury that could be found only in the capitals of the world. The copper mines of Montana were far away,

and contemporary opinions on the elder Clark never applied to the younger. It was said of William Andrews Clark in 1889 that he, "having been the maker of his own fortune by legitimate means, is justly regarded as a shining example of a 'great westerner'."[1]

The West attracted strong men in the nineteenth century. Every Western territory developed a set of economic-political leaders, a "big three" or a "big four," and even outlying Hawaii had her "five families." Such men were almost always from the East or Middle West, coming to the Western scene in its second stage of growth – after the towns were founded, but before the economic plums were garnered, and in time to establish the political pattern that could be reflected on a national scale.

Although a majority of the Western politicians at that time were Republicans, in Montana the latent interest in state ownership of natural resources served to attract many men to the Democratic standard. Clark and his associates were in the Democratic party because they could find support here for the measures that they thought would benefit their state, and consequently themselves. This alignment did not, however, preclude differences between them. Montana's "big four" – Marcus Daly, Samuel T. Hauser, Charles A. Broadwater, and William Andrews Clark – all Democrats and magnates, were often at odds, one with the other. For example, the feud between Clark and Daly of Anaconda, in politics and in the mines, ended only with Daly's death in 1900.[2] A Republican newspaper, the *Butte Inter-Mountain*, at the time of Montana's statehood in 1889, said of these men that they were ". . . not *leaders* in their party. They are autocrats – bosses of the

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[1]H. H. Bancroft, *Works*, v. 31: *History of Washington, Idaho, and Montana, 1845–1889* (San Francisco, 1890), p. 788.

[2]See K. Ross Toole, "The Anaconda Copper Mining Company: A Price War and a Copper Corner," *Pacific Northwest Quarterly*, v. 41 (1950), pp. 312–29, for a description of the business activtities from which, in part, the political rivalry of Daly and Clark arose. Marcus Daly was born in Ireland in 1840 and came to Montana in 1876. As founder of the Anaconda mine and smelter he was at one time the largest capitalist in the Territory. C. A. Broadwater, the only one of the "big four" without formal education, was born in Missouri in 1840. He arrived in Montana by way of Colorado at the age of 24. He was first a wagon-master for a shipping firm, and later rose to the presidency of the Montana National Bank in Helena. Samuel T. Hauser was born in Kentucky in 1833 and arrived in Montana in 1863. He was a banker and miner, but was largely interested in railroads, both local and transcontinental. He was president of a branch of the Northern Pacific, as well as organizer of the Utah and Northern Railroad. In 1885 he became governor.

strongest type. . . . The theory of the millionnaire employer that he can command the suffrages as well as the services of the employed is bad; and attempts to carry out such a theory are to be condemned, whether they occur in Pennsylvania or Montana."[3] Clark was a Pennsylvanian.

Although he came from Pennsylvania, William Andrews Clark appears to have been always more of the West than of the East. Like so many men of his century, he faced the mighty expanse of the Great Plains with unbounded expectancy. There is one opinion that "westernism," not money, constituted Clark's "eccentricity that set him apart as unusual."[4] The fact remains that Clark was a master of the rough and ready political and economic ways of the West. It was an open secret, for example, that he once paid $50,000 for fifty votes in the Montana Legislature. As one newspaper editor declared, "it is a western maxim that the man who can fight a lawsuit longest is the man who gets title to a disputed mine. All the mines that are much good are disputed. In Montana the rule was, if you want a suit decided your way elect your own judge; if you want a law enacted elect your own Legislature."[5] Clark could do these things along with the best Westerners.

He tried to become a Easterner again after he had gained his fortune, but with little success. His heart still remained in Montana, and his mean origin excluded him forever from the Social Register. Josh Billings, discoursing on "hosses," once said; "Pedigree's not important for a fast trotting hoss; if he can trot fast never mind the pedigree; there is a great many fast men, even, who ain't got not pedigree. . . ."[6] This homely frontier concept applied equally well to Clark. It was only after he had a family and great wealth that he began to seek a pedigree. He never found one for himself, but he made one for his great-grandchildren.

Clark was born on January 8, 1839, in Fayette County, Pennsylvania, into a log cabin-dwelling family of farmers.[7] Since he was the

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[3] Bancroft, *op. cit.*, p. 798.

[4] *New York Herald Tribune*, March 4, 1925.

[5] *Dallas Dispatch*, March 3, 1925.

[6] *Montana Post* (Virginia City), March 11, 1865.

[7] Many sketches of Clark's life have been written, but no complete biography. Paul C. Phillips wrote the article in the *Dictionary of American Biography*. An unfriendly view is given in C. P. Connelly, "The Story on Montana," *McClure's Magazine*, August and November 1906. Most of the works are eulogistic and uncritical.

only one of Mary (Andrews) and John Clark's children who ever rose to the level of a national reputation, none of the others are remembered in public records. It may be assumed that the family was typical of the occupants of the farm lands and the towns to the rear of the frontier in the process of westward expansion. In 1856, just a decade after Iowa became a state, young Clark accompanied his parents there to occupy an established farm. He had already attended public school in Pennsylvania and had graduated from Laurel Hill Academy. During the next six years he taught school briefly in Missouri, finished another term in an academy, and commenced the study of law in the Methodist college at Mount Pleasant, Iowa.[8] The two years spent in this pursuit gave Clark the necessary legal foundation for his subsequent activities in Montana, and was of great use to him when he came to organize the various mining and merchandising enterprises from which he amassed his fortune.

He was bitten, in 1862, by the "mining fever," and made his way to Colorado. No great success came his way at South Park, and soon he set out for Bannock City, Montana, the scene of rumored richness in the ore-bearing rocks. After sixty-five days on the trail, he arrived with a total capital of five dollars—which he immediately spent for postage—at one dollar a letter. At this point he exhibited a trait acquired from his God-fearing Scotch-Irish parents: to make money one must sell something at a profit. He had picked up a set of elk horns on the road, and laboriously brought them along. Now, in order to recoup his fortunes, he sought out a saloon keeper in Virginia City and sold him the horns for ten dollars.[8]

Virginia City was a roaring miner's town of tents and board shacks where gold dust, whiskey, and violence held sway. Within three years it became the headquarters for outlying mining camps all over the county. From Silver Bow in 1865 came glowing reports of the richness of the "Original" lode – later abandoned, and still later acquired by Clark to form the basis of his mining ventures – and this proud report: "[The] morals of our town are good. Fights do not occur oftener than one per day, and, as yet, no one has been shot or killed, which fact speaks well for the camp."[9] This was not the case in Virginia City,

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[8] Now Iowa Wesleyan College.

[9] *Montana Post* (Virginia City), March 11, 1865.

despite Professor Dimsdale's school which he conducted "behind the corral" where the "curriculum of the established Seminaries is taught in the best approved fashion." The professor's well-meaning efforts had little influence on a good share of the population. All seasoned travelers sneaked out of town at night in order to avoid the highwaymen who preferred to find their gold dust already washed and in a pouch.[10]

One of Clark's critics has described him as a "little red-headed man" with a "pack on his back" and wearing "a red shirt and an old army overcoat with one of the tails burned off from too close proximity to a camp-fire."[11] What was left out of account in this appraisal was the hard, jutting chin that marked a stern and determined face. Even with the full beard that Clark affected during the latter half of his life, his chin should have warned any observer that here was a man who would fight and probably win.[12] When Clark arrived in Montana he had with him three books: the *Poems* of Robert Burns, Hitchcock's *Elements of Geology,* and *Parsons on Contracts.*[13] These books represent the essence of his credo. The wry humor of the Scottish poet allowed a man to laugh at himself quietly, yet not lose his self-respect. Geology was the scientific means of making mother earth yield her mineral riches. A contract was sacred – if properly drawn, with credit given and not asked. Adding this credo to his compulsive character and his "wonderful capacity for details," it is little wonder that Clark could combine mining, merchandising, and banking to make a great success.[14]

He read his books and kept busy at propecting and mining, gradually accumulating some working capital. All the while he never let go an opportunity to turn a dollar's profit. He discerned the potential

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[10] *Ibid.*

[11] William D. Mangam, *The Clarks – An American Phenomenon* (New York, 1941), p. 17. This book is a scurrilous attack on the moral character of the whole Clark family. Its inspiration seems to have been the author's unwarranted pique at having been left out of the will of William Andrews Clark, Jr., who died in 1934. For nearly thirty years Mangam was his business agent, and it is significant that most of the Clarks were dead when his book was published. In spite of its claim to objectivity, the work is neither good history nor convincing as a denunciation. The author did, however, know his subjects personally and could, therefore, speak with a sense of familiarity.

[12] See the frontispiece reproduction of a bronze bas-relief in *Society of Montana Pioneers: A Brief History of the Memorial to Hon. William Andrews Clark* (Helena, 1920). Hereafter cited as *Brief History.*

[13] Mangam, *op. cit.,* p. 18.

[14] *Daily Missoulian,* March 4, 1925.

market for food in Virginia City and stocked up on as much flour and eggs as he could buy. The eggs he sold for three dollars a dozen for use in the popular "Tom and Jerry" camouflage for the raw whiskey available. When the price of flour finally reached one hundred and fifty dollars a hundredweight, even the plentiful gold dust ran short in many pockets, and a riot was the result.[15] Clark, however, was "shrewed enough not to wait until the people rioted." He "disposed of his flour when the price was high," but not yet dangerously so.[16]

Many years later his own newspaper, the *Butte Miner,* carried his reminiscences of the days in Virginia City. He boarded for a prudent twenty-five dollars a week, sleeping in a free room back of a store. He watched for a chance to earn money, always conserving what he had already earned. Considering himself a highly moral man, he deplored the tawdry antics of his associates in their search for free-time entertainment; but, never a reformer, he did not seek to change their habits. He wrote: "There was little in the way of amusement... during the winter, outside of the hurdy-gurdy dance halls, of which there were several in operation, and which afforded the young fellows, and some of the older ones, a speedy opportunity of separating themselves from their gold dust at the rate of $1 a dance of about 10 minutes duration."[17]

His own entertainment is not recorded, but neither is that of Carnegie or Rockefeller; with such singleness of purpose to get rich, little time could remain for relaxation. His only vacations in those early days were occasional trips east "to celebrate a business coup," when he peddled pork enroute to pay expenses." The author of this remark saw only the "pinch-fisted" side of Clark and failed to recognize in him the prototype of American success.[18] Clark himself was proud of his frugality in being able to pay part of the expense of these jaunts, which were essentially of a business character anyway, and he was glad of a chance

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[15] H. A. Trexler, *Flour and Wheat in the Montana Gold Camps* (Missoula, 1908), pp. 8–11.

[16] *Daily Missoulian,* August 26, 1917. Clark at one time paid $208.80 for 261 pounds of flour. It was his position that Montana ought to produce its own wheat (Mangam, *op. cit.,* p. 29).

[17] "In Memoriam: William Andrews Clark," MS dated March 2, 1925, in the Clark Memorial Library, University of California, Los Angeles.

[18] Joseph K. Howard, *Montana: High, Wide and Handsome* (Yale U. Press, 1943), p. 58. This author surmised more than he knew about Clark.

to sharpen his trading acumen by contact with merchants in St. Louis and Memphis.[19]

On one such trip, in 1869, he returned to Connelsville, Pennsylvania, and renewed a dear contact of his youth. He was back in Montana very soon with a bride, Kate Stauffer, a childhood friend. Their first child was born the next year and followed by five more, but two of the children and their mother died before 1893.[20] Clark's worship of his own mother was carried over to his wife. He embalmed her memory in his subconscious to the point, it was said, of being reluctant to marry his second wife who bore him two more daughters in the autumn of his life.

Even though the undisputed master of his family and his fortune, Clark was caught somehow in a feminine-inspired mode of rigidity. As one of his admirers put it, a "black-eyed, gentle-voiced mother was very potent in giving him first lessons in obedience."[21] He identified his mother's supposed goodness with a sense of his own self-righteousness which never forsook him in time of need. He bore her family name, passing it on to two of his children. When Clark was beginning to accumulate his second hundred million, he felt affluent enough to perpetuate his mother's name in the Mary Andrew Clark Home for Working Girls, a magnificent edifice in Los Angeles devoted to the rehabilitation of wayward young women.[22]

By 1872, Clark was a successful merchant in Deer Lodge, making as much as six hundred per cent on his sales. In the same year he was associated with two partners in a bank in that city. By this time he had grown the beard, which was his customary adornment for the rest of his life. He was described as a "tight white-starched little man, proud and pinch-fisted. . . ."[23] As a banker and a man of substance, he now gave up the Presbyterian faith of his fathers and entered the more affluent circle of the Episcopalian congregation. One of his critics has attacked his motives in this; but certainly, as a man grows, his religion may

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[19] *Butte Miner*, March 3, 1925.

[20] *New York Evening Post*, March 3, 1925.

[21] *Brief History*, p. 10.

[22] *New York Evening Post*, March 3, 1925.

[23] Howard, *op. cit.*, p. 58.

alter along with his other tastes. Little attention has been paid to the fact that just after Bishop Daniel S. Tuttle, builder of the Deer Lodge Episcopal Church, had converted him, Clark's bank lent the Bishop enough money to complete the edifice.[24] Nor was it considered wrong that he should lend, in his role of banker, $30,000 on the Dexter stamp mill, which he later obtained by foreclosure.[25]

After he had gained control of several unworked Butte mines – the Original, the Colusa, the Gambetta, and the Travona, as well as the Dexter mill – he quietly examined these properties in detail. He did it himself, with a rock hammer and sample bag, relying on his own energy and judgment as he did in all his enterprises. Clark made it a maxim to attend to details and to trust no one unless he had to. After digging around in his mines for a while, he announced that he and his family were going to make an extended visit in the East. He deposited his wife and child at their old home in Pennsylvania, and settled down himself at Columbia University in New York to study geology. In order to know what he was doing in the mining business, he felt that he had to add the proper scientific knowledge to his already sufficient training in the law and his extensive experience in mercantile enterprises.[26]

After two years of study he returned to Montana, which he always considered his home, and with his new-found knowledge he made a rich silver strike at the Travona mine in 1874. He was now, at the age of thirty-five, wealthy even by the standards of the mining frontier. Some men might have stopped at this point to enjoy the fruits of twelve years of hard labor and forbearance; but Clark was impelled to go on, to acquire more, to beget children, to found a dynasty, to gain power and exercise it. As a Texas newspaper said at the time of Clark's death, ". . . he started with nothing and acquired a tremendous fortune. The getting of it was a fascinating game, although at times a gruelling one. When he got it he hardly knew how to spend it. Most of the fun in life is in playing the game. . . ."[27]

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[24] Merrill G. Burlingame, *The Montana Frontier* (Helena, 1942), pp. 302–303. Cf. *Contributions to the Historical Society of Montana*, v. 6 (1907), pp. 384 ff.

[25] Mangam, *op. cit.*, p. 39; *New York Herald Tribune*, March 3, 1925.

[26] W. A. Clark, "Centennial Address, October 11, 1876," *Contributions to the Historical Society of Montana*, v. 2 (1903), pp. 45 ff. Cf. Mangam, *op. cit.*, p. 45.

[27] *El Paso Herald*, March 4, 1925.

In the next five years he began to emerge as a principal figure in Montana affairs. His name appears in a Helena business directory of 1879 as "banker."[28] He was becoming a force with which Montanans would have to contend or which they would have to accept. He could not be ignored. He was sent to a nationwide conference in New Orleans, for example, and to the Centennial Exposition at Philadelphia where he extolled the greatness and the richness of the West.[29]

The Colorado and Montana Smelting Company was organized in 1879 and, even though the other members did not want him in the company at all and called him a "Juggernaut" and "dangerous," he forced them to take him in with a one-fifth interest and a vice-presidency. He was such a large ore shipper that he had to be included. He later acquired his own smelter, and then presided over the liquidation of the first company.[30] This might be called ruthless, and undoubtedly it was "dangerous" to his erstwhile business associates, but Clark was on the way up. Nothing could stop him from becoming large. As his official eulogist said, because he was born ". . . in a log cabin, it did not follow that he should have nothing but log cabin ambitions."[31] Nature gave him a small frame, but he was not forced to limit his activities to a small scope.

Clark's physical stamina and durability, and his freedom from ordinary fear, are evident at every stage. In the first place, he could survive the rigors of the frontier – its climate, diseases, and violence – and this put him out of the class of weaklings. His prudence in abstaining from fighting, as well as from drinking and debauchery, played a part; but exposure to physical danger was never one of Clark's fears. His fear was the formless anxiety of infantile insecurity, to be drenched only by accumulating wealth. He looked at simple danger and hardship as the price of gaining a reward. On one occasion he bought an apparently worthless claim in Arizona; and alone as usual, clad "in overalls and armed with a rock hammer," he spent three weeks exploring the mine. His efforts were richly rewarded in a short time by a return of

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[28] William G. Bailey's *History and Directory* (Helena, 1879). Bailey, a jeweler in Helena, published this directory as an advertising medium.

[29] Clark, *op. cit.*, p. 45.

[30] Mangam, *op. cit.*, p. 53.

[31] *Brief History*, p. 9.

5,000,000 pounds of copper a month.[32] This was the foundation of the Clark holdings in Arizona that finally produced an inheritance tax to the state of $5,000,000.[33]

Earlier, when the opportunity arose, Clark added a military title to his growing list of honors. In 1877 Chief Joseph and Nez Percé Indians rose in a final revolt against the white settlers who looked as though they were in Montana to stay. A serious campaign was necessary to subdue them, and on July 29, 1877, Captain Clark appeared as a company commander in the militia.[34] Five days later he was listed as Major Clark in charge of a battalion of four hundred Montana Volunteers.[35] Colonel John Gibbon's regular Army troops were beleaguered at Big Hole Basin, and Major Clark led his three companies to Gibbon's relief. His performance was capable and valiant. Many years later an over-enthusiastic admirer tried to sell a lurid account of the "Busy Banker's Rapid Ride" to *Frontier Magazine*.[36]

By the time he was forty years old Clark, with a growing family, a handsome wife, an unquestioned position in Montana, and a large fortune, began to exhibit social aspirations in a wider sphere. His business was taking him more and more to New York, and his compulsive desire for recognition and prestige prompted him to seek a Union League Club membership.[37] It remained, however, for one of his daughters to gain a place in the New York Social Register – at a cost of three judicious marriages and the expenditure of millions. Only then was Clark able, through his favorite child, to project his long-thwarted hope into reality. This frustration and his children's inability to find lasting

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[32] *New York Herald Tribune*, March 3, 1925.

[33] *Arizona Daily Star* (Tucson), March 5 , 1925; *Arizona Republican* (Phoenix), March 5, 1925.

[34] Paul C. Phillips, ed., "The Battle of the Big Hole," *Historical Reprints: Sources of Northwest History, No.* 8 (Missoula, 1929), p. 11.

[35] *Ibid.*, p. 16.

[36] J. W. Redington to W. A. Clark, Jr., September 10, 1927, in the William Andrews Clark Papers (Clark Memorial Library, University of California, Los Angeles). This letter transmitted the story of "... your father's battalion of Montana Volunteers while in the field against hostile Nez Percé Indians in 1877...." The author, who had known Clark well, "added a 12,000 word manuscript to the collection" of the Historical Society of Montana, describing "the activities of Major Clark's Volunteer Battalion." See *Calendar of the Montana Papers in the William Andrews Clark Memorial Library*, Southern California Historical Records Survey (Los Angeles, 1942).

[37] Clark to Wilbur F. Sanders, May 29, 1881, in the William Andrews Clark Papers.

happiness were the only problems of Clark's life that he was unable to solve.[38]

For such a man as Clark, it was inevitable that politics would beckon. His entry into this field was as a representative of Silver Bow County to the constitutional convention at Helena in 1884. In this first, abortive attempt of Montana Territory to become a state, Clark was elected chairman of the convention either as a tribute to his leadership or as a result of the other delegates' fear of him.[39] The constitution produced at this meeting was so obviously in the sole interest of the mining men, and so dedicated to the purpose of reserving rights to the state, that Congress would not accept it. Also, the Northern Pacific Railroad saw nothing to gain from Montana's becoming a state at this time, fearing that she would gain control of the road's right of way and raise its taxes.

By 1889 the pressure for statehood was so strong that Montana was included in the "omnibus bill" of that year. Again Clark was chairman of the convention, and the mining interests were substantially safeguarded. The organic law was constructed, under the guidance of Clark and Daly, to exclude forever any serious competition from the agricultural and railroad forces – or so they thought.[40] Clark was so sure that he would be sent to the Senate that he failed to recognize the basic enmity toward him shown by Marcus Daly's group in the Democratic party. Daly rankled deeply over Clark's having pushed him out of Butte. The founder of Anaconda, working quietly – by bribery, Clark said – elected his own Democratic senator. At the same time, all the Democrats together defeated the strong Republican candidate, but Clark lost out by three votes. From this time on Clark and Daly were bitter, avowed enemies.[41]

To make Clark's gall more bitter, the man who beat him was an old rival, Thomas H. Carter. As a Republican Carter had previously triumphed over him, in 1888, for the popularly-elected office of Territorial Representative in Congress. When the same man, having turned

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[38] *Philadelphia Public Ledger*, March 3, 1925.

[39] Henry S. Clark to W. A. Clark, Nov. 13, 1883; William Andrews Clark Papers. This item includes Clark's certificate of election to the constitutional convention.

[40] *Proceedings and Debates of the Constitutional Convention* (Helena, 1889), pp. 472–74.

[41] Howard, *op. cit.*, pp. 64 ff.; Bancroft, *op. cit.*, pp. 786 ff.

Democrat, was now elected by a legislature over which Clark thought he had control, his chagrin was almost unbearable.[42] Republican Joseph K. Toole was elected Governor, but he failed to take a strong partisan stand and each party held separate caucuses in the legislature for the purpose of choosing senators. Governor Toole deplored this ". . . determination on the part of both Republicans and Democrats to take possession of the Court House."[43] The result was the election of four senators, none of whom was seated when they went to Washington.

Actually, the division between Republicans and Democrats in Montana was along the lines of basic antipathy between stock raisers and miners, and on the basis of personal competition. The national policies of neither party were acceptable. For example, Governor Toole's appeal to Congress for Federal aid in irrigating arid lands, since it did not extend to control of forests or mines, was supported by Clark. On the other hand, Daly, also a Democrat, was against the measure because Clark was for it.[44] Later, when it came to a matter of setting aside large forest reservations in Montana, both parties strenuously opposed the measure, ". . . knowing that its enforcement would seriously cripple and retard . . . development."[45] In other parts of the West, predominantly Republican in sentiment, all Democrats were identified with the Populist upheaval. From Los Angeles, reprinted from the New York press, came the following: "Those western Democrats who are clamoring for free trade, free silver, and free whiskey, might make their platform still more popular with their party by inserting a plank demanding free lunch."[46] Such an opinion was, of course, not at all applicable to Clark and the Montana Democrats. He was motivated by what he considered his state's and his own interests. In his view mining was the backbone of Montana's economy. He had gone into it for that reason. He believed that the Democratic party best represented that interest, and that he could best represent the party.

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[42] *Ibid.*, p. 787.

[43] R. P. Stout (compiler), *Official Correspondence relating to the Admission of Montana as a State into the Union . . . including Proclamations and Official Addresses of Jos. K. Toole, Governor . . .* (Helena, 1892), p. 6.

[44] *Ibid.*, p. 12.

[45] *Congressional Record*, 54th Cong., 2d Sess. (1897), p. 2548.

[46] *Los Angeles Times*, August 10, 1891.

When Clark died in 1925, a New York newspaper said that he had resolved "to add the title of Senator to his collection of objects d'art" – and that in this he was opposed by Marcus Daly, who collected only money and horses.[47] It is easy to attribute petty motives to men, especially when the means used to attain their ends are not above suspicion. Clark's ambition was boundless and his compulsion to succeed was deep-rooted and pervasive. It was said that in 1893 he bribed the legislature to send him to the Senate. When he was again positive of his election, it appeared that his titan-adversary had bribed the legislators over his head. In any event, for the second time, he failed to go to Washington.[48]

Once more, in 1899, with unsurpassed perseverance and the expenditure of how many thousands of dollars no one has ever determined, Clark sought to become a United States Senator. He had already assumed the title and it was recognized all over the West.[49] He received the necessary majority of votes in the legislature (eleven of the fifteen Republicans voting for him), and duly set out for Washington.[50] Destiny was not, however, to allow him to go unchallenged. Senator Carter, his long-time rival, precipitated a Senatorial investigation that lasted three months and is recorded in three thick volumes which almost reek from the epithets and charges they contain.[51] Typical of the testimony is the lurid description of how State Senator Myers of Ravalli County was allegedly bribed for $10,000 to vote for Clark. Charles W. Clark, the Senator-elect's second son, was the supposed go-between for his father and legislator. Another state senator, Fred Whiteside, who also had been "fixed," tesified against Clark at the Senate hearing. He apapparently "regretted" his part in the election of Clark, who accused Daly of bribing him to that feeling. Whiteside had been "considered... absolutely reliable" by Clark at the time of the election.[52] Whiteside swore that he had been "approached" by Clark's son and an attorney for the purpose of corrupting Senator Myers. After some preliminary

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[47] *Syracuse Post-Standard*, March 5, 1925.

[48] Howard, *op. cit.*, p. 65.

[49] *Los Angeles Evening Express*, March 27, 1897.

[50] Howard, *op. cit.*, p. 67.

[51] U.S. Senate, 56th Cong., 1st Sess. (1900), *Report 1052*, pt. 1, p. 1.

[52] *Ibid.*, p. 515.

meetings Whiteside met the attorney, John B. Wellcome, in the latter's hotel room. He gave the following account before the Senate committee some months later:

> Mr. Wellcome took me into the bathroom adjoining the room he occupied and took out of his pocket an envelope with a large number of bills in it. I would not say there was an envelope. There may not have been. He took a large number of bills and counted out $10,000 and handed it to me, and told me to go and fix the matter up with Mr. Myers. I objected to this and told him that I preferred he would do it himself, and insisted that he do so, but he refused to do it; he made some excuse at least, and said, among other things, that he would trust me to do it, and asked me to do so. I took the money and went out, just across the hall, into the other room where Mr. Myers was and put it in an envelope, counted it first in Mr. Myers presence, and put it in the envelope and sealed it. Mr. Myers put his initials upon it, and kept the money with the other envelopes I had until it was turned in to the committees when they took the evidence.[53]

Whiteside failed to explain why he had waited so long to divulge his information, or why he had voted for Clark if he intended to expose him.

The Montana "committee that took the evidence" dramatically brandished its $30,000 bribe money, in convenient $1,000 bills, as damning proof that Clark had bought his way into the Senate. The United States Senators listened to the testimony and saw the "proof," but no convincing case could be made for either side, except that it was quite clear that no one concerned was above reproach. As to the money, symbol of guilt, it could have come from either Daly's or Clark's long pocketbooks. Its final disposition was never fully determined. The Senate Committee on Privileges and Elections, "as a duty to itself" and "to the people of Montana," resolved "that seats in the United States Senate procured as Senator Clark's has been procured can not be retained by the deliberate judgment of the Senate." The verdict was that "William A. Clark was not duly and legally elected to a seat in the Senate of the United States by the legislature of the State of Montana."[54]

Clark claimed ". . . that the methods of procedure in the investigation . . . were manifestly unfair, nonjudicial, and that they resulted in a verdict . . . entirely opposite" to the wishes of ". . . 80 per cent of my

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[53] *Ibid.*, p. 113.

[54] *Ibid.*, p. 15.

constituency in the State of Montana, regardless of political affiliations. . . ."[55] He ended his rebuttal with a blast against Daly as the underlying cause of all his troubles. He berated "the insolent domination, the blacklisting, the boycotting, and political debauchery of this man and his associates, who have without cause or provocation pursued me so relentlessly, and whose perversion of wealth, extracted from the great mines of Butte, has left in its train the financial and moral ruin of men, the misery of women and children, the destruction of personal liberty, and a blight and stain upon the fair name of our State." In a tacit admission of the charge of bribery, he continued: "How was it possible to attack this un-American despotism . . . without a great effort which only money could secure. I was in a postion to aid in this work and I am proud that I undertook it. It was done . . . with honesty of purpose, and . . . the honest people of my State approve my action and will accord me grateful recognition."[56] He never mentioned his unsuccessful attempt to bribe Attorney General C. B. Nolan, at the price of $100,000, to stop proceedings against "that splendid man," John B. Wellcome, the attorney mentioned in the testimony.[57]

Clark placed his "resignation in the hands of the chief executive of Montana," and retired. He wrote that he was "conscious of the rectitude of my own conduct."[58] But he was, even then, not ready to give up. The Governor of Montana was away when the Senate seat was declared vacant, and Acting Governor A. E. Spriggs, sympathetic to Clark, appointed him immediately to fill out the "unexpired term." This was such a palpable fraud that Clark was unwilling to go through with it even if he could have. He returned home, determined more than ever to become Senator in fact as he had been in name since 1889.[59] Instead of trying again to "persuade" the state legislators to elect him to the Senate after they had obtained their own offices, Clark now made sure of such a result by spending sufficient money and energy to get a whole legislature elected. Marcus Daly's health was failing

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[55] W. A. Clark, *Speech in the Senate of the United States* (Washington, 1900), p. 3.

[56] *Ibid.*, p. 27.

[57] U.S. Senate *Report 1052*, pt. 1, p. 14.

[58] Clark, *Speech in the Senate . . .*, p. 28; Howard, *op. cit.*, p. 68.

[59] *Butte Miner*, March 3, 1925.

in 1900, and his political influence was beginning to wane. Clark exacted the promise of a Senate seat from all the candidates that he supported, and guaranteed their performance by tying them to himself with economic bonds. He held a number of mortgages, and his "pension list" was reputed to $750,000 a year.[60] Finally, in 1901, he went triumphant to Washington. His arch-enemy was dead, and he was truly and without question a senator at last. As a commonly circulated story had it, ". . . after several strivings," he "got an election from the Montana legislature. He was in Washington a spell as a senator of the United States, but his method of collecting a legislative majority for election stayed with him and made him of little power there."[61]

It is true that Clark's name was not connected with any outstanding legislation during his six-year term. His main interest was and had been always furthering the welfare of his own state. In 1889 he had favored Governor Toole's request for Federal aid to irrigation.[62] He had taken part in his state's opposition to Federal control of forests when that idea was being urged in Congress in 1897.[63] "Strong representations" were heard from Clark and others concerning this "most serious blow to the development and prosperity of the Western country."[64] In the Senate until 1907 Clark continued his fight against Theodore Roosevelt's conservation program which he felt was a distinct threat to the continued growth of his beloved Montana.[65] Incidentally, mining and railroading could not possibly benefit from Federal forest protection – and Clark had become interested, along with Senator Kearns of Utah, in the San Pedro, Los Angeles and Salt Lake Railroad. He owned a half interest in this line until it was purchased by the Union Pacific in 1921, when he became a director in the larger company.[66]

One more adventure remained to Clark outside the field of management of his fabulous and growing empire. When he was finally elected Senator his wife had been dead for over ten years, and his children

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[60] *New York Evening Post*, March 3, 1925; Howard, *op. cit.*, p. 76.

[61] *Syracuse Post-Standard*, March 5, 1925.

[62] R. P. Stout, *op. cit.*, p. 12.

[63] *Congressional Record*, 54th Cong., 2d Sess. (1897), p. 2548.

[64] *Los Angeles Evening Express*, March 27, 1897.

[65] *Congressional Record*, 59th Cong., 2d Sess. (1907), p. 3724.

[66] *Boston Transcript*, March 3, 1925; J. H. Anderson to John A. Stewart, March 13, 1925, William Andrews Clark Papers.

were all practically adult. They were beginning to show signs of disappointing their father that were to be fully realized as the years went by. Unlike many men of sixty, Clark was still vigorous and virile. Some time before he had taken as his ward a girl forty years his junior, Anna Eugenia La Chapelle. Her parentage is obscure, and the reason for Clark's taking charge of her education is vague. He sent her to France to school, and little was said or heard of her until 1904. In that year Clark suddenly announced their marriage when he had been in Europe in 1901, and the existence of a two year old daughter.[67]

The same day, his rivals in Anaconda published a story and picture not at all complimentary to either Senator and Mrs. Clark. Anna Eugenia was called an adventuress, and it was pointed out that Clark could not possibly have married her because his itinerary in France had not been convenient: he had not, by his own admission, gone anywhere near her home, and he had been constantly attended by many persons.[68] His most virulent biographer, William Mangam, accepted the Anaconda story.[69] Objectively considered, neither Clark's version nor the Anaconda story seems to indicate the true status of Clark's second marriage. He was evasive about it all his life, and when he died Anna and their surviving daughter did not come in for a major portion of the estate. Clark's children by his first wife inherited most of it, and they seemed to begrudge the second Mrs. Clark even the two and a half millions that became her share.

In order to explain Clark's elderly adventure in matrimony, one must remember his overpowering urge to compensate for his own shortcomings in his children and his desire to project his strength into the second generation. In neither area was he successful. Neither he nor his children could get into the Social Register. His sons were never capable of being more than "second in command" of his business activities. He had forced his elder boy out of a natural inclination in the arts to become a lawyer. The young man's response was obedient but never enthusiastic. He disliked law and only waited until his father died to indulge his early tastes in music and letters.[70] The other son, Charles,

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[67] *Butte Miner*, July 13, 1904.

[68] *Anaconda Standard*, July 13, 1904.

[69] Mangam, *op. cit.*, pp. 102 ff.

[70] *Constructive Californians* (Los Angeles, 1926), pp. 81–84.

remained a business man and dabbled in politics in Montana and Arizona, but he was never of his father's stature. Add to these disappointments Clark's amazing virility, his strong ego, and the fact that his first wife had been dead for a long time – and it is not remarkable that he would wish to marry again at an age when most men are preparing to relinquish their activities. He endowed his sons with money enough to permit them to enjoy their hobbies, built himself a mansion for his rugs and paintings, married a young wife, and lived to the age of 86.[71]

His second marriage was apparently a happy affair. He, his wife, and young daughters spent their time in the family's sumptuous homes in New York, Paris, Butte, and Santa Barbara.[72] During the last fifteen years of Clark's life the momentum of accelerating business took away the necessity for constant supervision that had been the case in the early years. He had attained all his personal goals; only the comforting addition of more and more property was required to satiate his endless ambition. This need was now largely satisfied by the almost automatic accretion of his fortune. He became the owner of public utilities in Missoula, of Mexico's largest coffee plantation, of rock quarries in Maine, of a furniture factory on Long Island, of a sugar refinery in Los Angeles, and of mines, smelters, and foundries all over the West. He was a magnate in mining, lumber, land, and cattle.[73]

With this great domain well in hand, Clark could indulge what he called his "natural aesthetic sense" and gather together one of the world's greatest collections of art treasures. By some standards it might have been judged more expensive than perfect. His taste was more catholic than discriminate, as long as the desired object was rare and expensive. His collection included Rembrandt's "Portrait of a Man" ($180,000), Corot's "Dance under the Trees" ($100,000), and Sir Henry Raeburn's "Portrait of the Artist's Daughter" ($140,000), as well as twenty-two other Corots, a Beauvais tapestry, and six panels of Joan of Arc's life by Boutet de Monvel.[74] He willed his treasures to the Metropolitan Museum of Art, but the impossible stipulation that the

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[71] *Syracuse Post-Standard,* March 5, 1925.

[72] *New York Herald Tribune,* March 3, 1925.

[73] *Pueblo* (Colorado) *Chieftain,* March 7, 1925.

[74] *Corcoran Gallery of Art: Illustrated Handbook of the W. A. Clark Collection* (Washington, 1932).

collection be kept intact prompted the director to refuse his "very generous offer." The paintings finally came to the Corcoran Gallery in Washington.[75]

At 7:30 on the evening of March 2, 1925, from the bedroom of his famous mansion at 962 Fifth Avenue, New York City, came word that Clark was dead. Until December of the previous year he had conducted his business personally, using the subway to travel about the city because his distrust of automobiles amounted to a fixation. The last three months of his life he controlled his vast network of enterprises from his bed, and no one ever followed him as sole manager of his affairs. Even on his dying bed he pursued his accustomed way. No period of coma preceded his passing; he was lucid to the end. Concerning the stipulation in his will in regard to his art collection, the *Brooklyn Eagle* commented: "Granting the public spiritedness of Mr. Clark's bequest, it is a pity that he should have wanted to perpetuate his ego, to the extent of making his generosity a problem for those who know best how to make it most effective."[76] Even in death he was unwilling to be dominated.

Every important newspaper in the United States noticed Clark's death.[77] The West had lost a remarkable man "symbolic of true Amer canism and true westernism."[78] The many accounts of his life varied from admiring encomium to vitrolic damnation. Those journals nearest his home, and directly after his death, showered praises on the "great man."[79] Farther away he was considered less of a patriot and more of a ruthless business man, but everywhere it had to be admitted that his accomplishments had been mighty. He reflected what ambitious Americans wanted to be. He was second only to such titans as Andrew Carnegie, John D. Rockefeller, and Henry Ford. A balanced editorial judgment of the man was this: "He may be regarded as a typical American success in affairs and in money-making. That he is a good

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[75] *Milwaukee Leader*, March 7, 1925. Cf. Burlingame, *op. cit.*, p. 331.

[76] *Brooklyn Daily Eagle*, March 12, 1925.

[77] *Chicago Evening Post*, March 3, 1925.

[78] *Great Falls Leader*, March 4, 1925.

[79] *Daily Missoulian*, March 3, 1925.

example to offer without qualifications to our boys and young men may be doubted."[80]

William Andrews Clark was an American success, but one leaves him wondering why his children were not happier, and why one of them had to spend his life in fruitless conflict with his own emotions. Clark's eldest son worshipped his father inordinately, although dominated by him to the exclusion of nearly all his own aspirations. When the father died, the son transferred his hero worship to Oscar Wilde's memory — and Wilde became to him an idol and a model of behavior.[81]

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[80] *Brooklyn Daily Eagle,* March 3, 1925.

[81] See *Some Letters from Oscar Wilde to Alfred Douglas, 1892–1897* (San Francisco: Printed for W. A. Clark, Jr., by J. H. Nash, 1934), with preface by the younger Clark.

THE WEST AND THE AMERICAN AGE OF EXPLORATION

by

WILLIAM H. GOETZMANN

The author, who received the Ph.D. at Yale, now teaches American history at that university. His *Army Exploration in the American West, 1803–1863,* was published by the Yale University Press in 1959.

OF ALL THE MAJOR EVENTS in American history, none has been so central as the experience of the westward movement. The story of the confrontation and eventual domination of the vast empty continent by successive waves of pioneer Americans has become our national epic. This epic was most clearly articulated by the historian Frederick Jackson Turner in his celebrated hypothesis on the significance of the frontier in American history. "Stand at Cumberland Gap," he declared, "and watch the procession of civilization marching single file – the buffalo following the trail to the salt springs, the Indian, the fur trader and hunter, the pioneer farmer – and the frontier has passed by. Stand at South Pass in the Rockies a century later and see the same procession with wider intervals between."[1] For Turner, and for those who have followed after him in the celebration of his American myth, it was the frontier which focused American energies; and it was the West as the place – wild, isolated, and infinitely challenging – which formed that peculiarly adventurous democrat, the American. Turner asserted:

> This perennial rebirth, this fluidity of American life, this exptnsion westward with its new opportunities, its continuous touch with the simplicity of primitive society, furnish the forces dominating American character. The

[1] F. J. Turner, *The Frontier in American History* (New York: Henry Holt, 1920), p. 37.

> true point of view in the history of this nation is not the Atlantic Coast, it is the Great West.[2]

Historians and poets of the West, taking their cue from Turner, have turned their backs upon the Atlantic Coast, and have looked at the great national experience as something Western – peculiarly Western. Indeed the very opposition between the Atlantic Coast and the Great West – between the rimland and the heartland, the old and wicked and the new and hopeful, as it were – has become a part of this national story. The westward movement of the American people has always been considered peculiarly "Western," and to suggest that it was anything else has been to taint somehow the pristine Americanness of the whole fable. The study of the westward movement is the study of what happened in the West and nothing else; unless, of course, one were to suggest that experiences in the West had great impact upon the rest of the country.

It has always been permissible, of course, for the Western historian to say with Turner, that "to the frontier the American intellect owes its striking characteristics."[3] But perhaps in celebrating and studying the great story of the westward movement the Western historian has taken too narrow a view. Perhaps he has really been guilty of underestimating the extent of this impulse to move into the unknown and uncharted wildernesses of the world. Might it not be possible that this experience in the American West was an experience that was characteristic of the whole of America rather than just a part of it? Indeed, there is reason to suspect that the impulse for expansion over the globe might even be as characteristic of European civilization as a whole as it was for those hardy pioneers way out West. It might even be that one of the reasons for the enthusiastic acceptance of the myth of the American West was its very centrality to the whole of American experience at that particular time and place in the nineteenth century, and perhaps even today.

The recent interest in cultural history, and the corresponding use of new source materials, has begun to afford the historian new points of view toward all aspects of American history. Increasing importance has been attached to the cultural settings of well-known political events,

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[2] *Ibid.*, pp. 2–3.

[3] *Ibid.*, p. 37.

and the historian has become more conscious of American behavioral patterns as they exist within the whole context of modern European experience. A recent example of this is Walter Prescott Webb's *The Great Frontier,* which takes a long view of the American frontier experience and designates to it a relatively small place in the course of the great 400-year boom which he declares has characterized European development since 1500.[4] Inaccurate though his work might be in detail and in some of the conclusions he draws, nevertheless Professor Webb's thesis must stand as a significant attempt to break free of traditional approaches to the American West which have been dominated too much by nationalism and emphasis upon internal political events. If it does nothing else, Professor Webb's thesis at least has the advantage of suggesting a new dimension for the expansion impulse and a new set of kinship relationships which extend to all parts of our common culture.

The purpose here is a similar one. Let us abandon for the moment the traditional narrow view of the expansion impulse and take up another point of view. Let us focus upon the history of exploration in the American West as part of the general history of American and European culture between the years 1800 and 1860, a quite arbitrary time span but one that is central to the course of American westward expansion. In this period public enthusiasm for the discovery and exploration of exotic places reached a culmination due to the impetus of the romantic imagination and the rapid development of scientific techniques. So widespread was such enthusiasm that one might almost be justified in calling this sixty-year period "The American Age of Exploration." The keynote of this public enthusiasm was struck on Columbus Day, 1855, in the Washington *National Intelligencer:*

> The present is emphatically the age of discovery. At no period since the days of Columbus and Cortez has the thirst for exploration been more active and universal than now. One by one the outposts of barbarism are stormed and carried, advanced parallels are thrown up, and the besieging lines of knowledge, which when once established can never be retaken, are gradually closing around the yet unconquered mysteries of the globe. Modern exploration is intelligent, and its results are therefore positive and permanent. The traveller no longer wanders bewildered in a cloud of fables prepared to see marvels, and but too ready to create them. He tests every step of his way by the sure light of science and his pioneer trail becomes a plain and easy path to those who follow. The pencil, the compass, the barometer, and the sextant

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[4]W. P. Webb, *The Great Frontier* (Boston: Houghton Mifflin, 1952), *passim.*

> are his aids; and by these helps his single brain achieves results now which it would once have required an armed force to win.[5]

The *Intelligencer* was not referring solely to American exploration but to activity by Americans and Europeans all over the globe. Stimulated by the eighteenth-century voyages of Captain Cook, the daring adventures of Alexander McKenzie, and the exotic excursions of Alexander von Humboldt into the green world of the Amazon Basin, Europeans and Americans alike increasingly began to undertake important expeditions – with the result that by about 1900 virtually all the interiors of the great continents had been explored, the sea lanes charted, and the Arctic and Antarctic discovered and to some extent explored.

Humboldt was a key figure of the period not only because of his work in South and Central America, but because somehow he combined the cosmopolitan rationalism of the eighteenth century with the newer romantic feeling for the grandeur and exoticism of nature into a scientific approach that could be understood and imitated by those who came after him. His purpose was as clear as any in that time of romantic strivings. From his field headquarters in the heart of the Andes he wrote:

> The ultimate aim of physical geography is . . . to recognize unity in the vast diversity of phenomena. . . . I have conceived the mad notion of representting, in a graphic and attractive manner, the whole of the physical aspect of the universe in one work, which is to include all that is at present known of celestial and terrestrial phenomena, from the nature of the nebula down to the geography of the mosses clinging to a granite rock. . . .[6]

Throughout the period he remained a kind of spiritual godfather and grand advisor to great numbers of American and European scientists and explorers. His influence on American explorers of the early West, for example, is clearly indicated by the fact that his name even today is attached to such prominent geographical features as the Humboldt Range and the Humboldt River.

At the outset certain geographical areas and problems were of special interest to various nations. Since Napoleon's campaigns in Egypt, French, British, and German explorers roamed over the continent of Africa in increasing numbers, searching for everything from gorillas to the source of the Nile. Men like Speke, Burton, du Chaillu, Krapf,

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[5] *The National Intelligencer* (Washington, D.C.), October 12, 1855.

[6] Quoted in Victor W. von Hagen, *South America Called Them* (New York: Knopf, 1945), p. 145.

and Livingstone were heroes of the hour as they searched out the secrets of the dark continent. In North America the central focus was for a long time upon the discovery of a Northwest Passage, or at least a satisfactory trade route to India. McKenzie's great Canadian explorations had not entirely solved this problem, and it was not until Lewis and Clark marched down the Columbia to the Pacific, that any satisfactory answer was forthcoming. National rivalries over the priority of discoveries developed a particular intensity, not only in North America and Africa, but even in such remote areas as the Antarctic where Europeans and Americans hotly contested the honor of discovering the new continent – even to the extent of warping the viewpoints of old and established learned societies. And all the while they remained virtually ignorant of its prior discovery by commercial sealers from Stonington, Connecticut, some twenty years before.[7]

Although these various expeditions throughout the world were based to a large extent upon the exigencies of national economic and political considerations, they were motivated also by an insatiable scientific curiosity. Most of the explorers seemed bent on collecting, examining, and classifying all of the various phenomena of nature which, in and of itself, seemed a vast and infinitely mysterious thing. Darwin's voyage on the *Beagle* (1832–36), inspired by the work of Humboldt, is an outstanding example of such intellectual activity.

In all of this furious activity the young republic of the United States played an important part. Under the guidance of Thomas Jefferson, Americans turned after 1800 to the task of exploring the Great West. Official expeditions were sent out under Lewis and Clark, Dunbar and Hunter, Dunbar and Freeman, Pike, and Stephen H. Long. Private John Colter of the United States Army, on detached duty from the Lewis and Clark Expedition, became the first American to see the marvels of Yellowstone Park. It was Jefferson who played the key role not only in the planning of the expeditions but in devising a proper way to present the projects to an economy-minded Congress little interested at the time in the possible contributions of "pure science." Invariably these expeditions were presented to Congress as economic and political necessities, with their scientific objectives appearing to be an afterthought.[8]

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[7]Robert G. Albion, "Nathaniel Palmer," *Dictionary of American Biography*, v. 14 (New York: Scribner's, 1943), pp. 189–90.

In considering the total picture of American achievement in exploration it would, of course, be a serious mistake to overlook the private interests that accomplished so much between 1806 and 1842. The mountain men, in particular, formed one of the most spectacular groups of explorers in all history as they roamed free and unrestrained (except by the Indians) all over the western half of North America. Jim Bridger, Jedediah Smith, and James Pattie were among the first Americans to see such geographical landmarks as the South Pass, the Great Basin, the Great Salt Lake, and the Grand Canyon. Fur magnates like John Jacob Astor, Pierre Chouteau, William H. Ashley, and Charles Bent, sponsored expeditions of their own which searched out the hitherto secret places of the West. On numerous occasions they afforded opportunities for savants, like the botanist Thomas Nuttall, or the geographer Joseph Nicollet, to extend their researches into the West.[9]

By 1842, however, the day of the mountain man was about at an end, and in that year Jim Bridger settled down to the life of a trader in his fort at the South Pass in the Rockies. Then a new era began, one that was dominated by the United States Army's Topographical Engineers, of which the most representative figure was the boyish hero John C. Fremont. Fremont's expeditions to the Far West in 1842, '43, '44, and '45 are all well known, but less well known are the exploits of his colleagues in the Corps of Topographical Engineers. Unlike the mountain men, these new explorers were interested in mapping the West and making its resources known to the generations of pioneers that would follow them. For the most part the Topographical Engineers considered themselves men of science, and they rarely failed to utilize the opportunities afforded them by their Western expeditions to record and publish their scientific data to the world.

During the Mexican War Lieutenants William H. Emory and James W. Abert explored and mapped the Southwest, calling the atten-

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[8] Bernard DeVoto's introduction to *The Journals of Lewis and Clark* (Boston: Houghton Mifflin, 1953), xvii.

[9] See Thomas Nuttall, *A Journal of Travels into the Arkansas Territory during the Year 1819* (Philadelphia, 1821); and Joseph N. Nicollet, *Report Intended to Illustrate a Map of the Hydrographical Basin of the Upper Mississippi River*, 28th Cong., 2d Sess., H.R. Doc. 52 (1843).

[10] See W. H. Emory, *Notes of a Military Reconnaissance from Fort Leavenworth in Missouri to San Diego in California, Including Parts of the Arkansas, Del Norte, and Gila Rivers*, 30th Cong., 1st Sess., Sen. Exec. Doc. 7 (1848); and *Journal of Lieutenant James W. Abert from Bent's Fort to St. Louis in 1845*, 29th Cong., 1st Sess., Sen. Exec. Doc. 438 (1846).

tion of scholars to the importance of the pueblos and other evidences of vanished Indian civilizations.[10] Later Captain Lorenzo Sitgreaves and Lieutenant James Hervey Simpson explored the pueblo country of Arizona and New Mexico more closely, and together with Emory and Abert they were instrumental in launching the study of archaeology in the Southwest with reports on such important sites as the Chaco and Chelly Canyons and the Casa Grande on the Gila River.[11] Captain Howard Stansbury and his assistant, Lieutenant John W. Gunnison, made the first scientific map of the Great Salt Lake in 1850, and Stansbury explored the western edge of the Lake for the first time.[12] Captain John N. Macomb picked his way through the incredibly difficult country along the San Juan River to the junction of the Green and Grand Rivers, and thus became the first American to thoroughly understand the broad outlines of the Colorado River system.[13] Lieutenant Joseph Christmas Ives chugged up the Colorado River in a homemade steamboat and led a party on foot to the floor of the Grand Canyon for the first time.[14] This was a sublime moment in the history of Western exploration. Captain Randolph Barnes Marcy discovered the long elusive sources of the Red River in the Palo Duro Canyon of the Staked Plains of West Texas.[15] Other Army explorers mapped the Great Basin and the Upper Missouri-Yellowstone River Country.

When these Army officers returned to make their findings known, they were assisted by the leading scientific men in the country — men like John Torrey, Asa Gray, James Hall, John Strong Newberry, and Louis Agassiz. F. V. Hayden's work with Lieutenant G. K. Warren in

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[11] See J. H. Simpson, *Journal of a Military Reconnaissance from Santa Fe, New Mexico, to the Navajo Country Made with Troops under Command of Brevet Lieutenant-Colonel John M. Washington, Chief of the Ninth Military Department and Governor of New Mexico*, 31st Cong., 1st Sess., Sen. Exec. Doc. 64 (1850); and Lorenzo Sitgreaves, *Report of an Expedition Down the Zuni and Colorado Rivers*, 32d Cong., 2d Sess., Sen. Exec. Doc. 59 (1853).

[12] See Howard Stansbury, *Exploration and Survey of the Valley of the Great Salt Lake of Utah* (Philadelphia, 1852).

[13] See J. N. Macomb, *Report of the Exploring Expedition from Santa Fe, New Mexico, to the Junction of the Grand and Green Rivers of the Great Colorado of the West in 1859* (Washington, 1876).

[14] See J. C. Ives, *Report Upon the Colorado River of the West*, 36th Cong., 1st Sess., Sen. Exec. Doc. (1861).

[15] See R. B. Marcy, *Exploration of the Red River of Louisiana in the Year 1852*, 32d Cong., 2d Sess., Sen. Exec. Doc. 54 (1853).

the Dakotas helped to launch the serious study of vertebrate paleontology in the United States.[16] Some of the scientists who accompanied the expeditions were so enthusiastic in the pursuit of knowledge that they even attempted to pickle some of the Indians and bring them back to the Smithsonian in a jar![18]

The outstanding publications of this period of military exploration in the West were the Mexican Boundary Survey report and the report on the surveys for the Pacific Railroad. The Boundary Survey report, in three massive volumes, constituted a matchless compendium of information on the Southwest, particularly in the fields of geology, botany and zoology.[18] The Pacific Railroad reports were published in thirteen volumes between 1853 and 1859, and these also included monumental data on bird, fishes, mammals, plants and geology.[19] The most important contribution of the Pacific Railroad reports, however, was Lieutenant G. K. Warren's master map of the whole trans-Mississippi West published in 1857. It presented for the first time a reasonably accurate and scientific outline of the whole country west of the Mississippi, and it was a climactic event in the history of Western exploration.

The maps, the reports, the illustrations, the scientific data, and most of all the accounts of the expeditions themselves all added up to a picture of the American West as a vast and exotic place – a land of gigantic sunless canyons, towering mountains, burning lakes and fountains, mud-daubed Indians who lived in sky-high palaces, locust-eaters scarcely out of the Stone Age, immense herds of buffalo stretching for miles over the limitless horizon – all virtually untouched by the hand of civilization. And though these reports were intended as scientific documents, they helped to set the tone of an age devoted to exploration and the romantic desire to see ever outward from the immediate circle of one's own existence to the remote frontiers of the universe, just as Hum-

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[16] F. V. Hayden and F. B. Meek, "Palaeontology of the Upper Missouri: A Report Upon Collections Made Principally by the Expedition Under Command of Lt. G. K. Warren, U.S. Top. Engrs. in 1855 and 1856," *Smithsonian Contributions to Knowledge*, v. 14 (Washington, 1865).

[17] Ives, *op. cit.*, p. 98.

[18] See W. H. Emory, *Report on the United States and Mexican Boundary Survey*, 34th Cong., 1st Sess., H.R. Doc. 135 (1857).

[19] See U.S. Senate, *Reports of Explorations and Surveys to Ascertain the Most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean*, 33d Cong., 2d Sess., Exec. Doc. 78 (1855).

boldt had dreamed of being the single genius who would capture all knowledge of the cosmos in one massive compendium. This compulsion, as much as the often-stressed desire for free land, drove the spearhead of American civilization into the West during the so-called period of Manifest Destiny.

This aspect of Manifest Destiny, however, was not confined solely to the desire to explore the Western land frontier. While most of the agrarian states were urging Federal sponsorship of Western surveys, maritime interests on the Eastern seaboard and professional scientists in Washington saw to the launching of naval expeditions to all parts of the world, some of them with the admitted purpose of maintaining the national prestige in competition with the other nations bent on exploring and subduing the globe. The first of these expeditions was conceived by John Quincy Adams, the most scientifically-inclined of American presidents. He had proposed, during his presidency, a naval expedition to the Northwest Coast that would not only collect scientific data but would also be of direct assistance to American maritime interests in whaling and trading.[20] His plan would complete the much desired passage to India. The plan, however, languished during the administration of Andrew Jackson. Finally in 1838 the United States Exploring Expedition, commanded by Lieutenant Charles Wilkes, set sail for the Pacific by way of South America and Cape Horn. This expedition, the most spectacular of its day, was gone for four years during which time it made scientific surveys and collections in South America, re-discovered the Antarctic Continent, charted its coast, made extensive explorations in the South Seas and Polynesian Islands, and cruised along the Northwest Coast of North America where a shore party mapped much of what is now Washington and Oregon. Although the expedition included only one first-rate scientist, James Dwight Dana, it still contributed a great deal to science in the form of maps and collections.[21]

South America proved irresistible to Navy explorers. Like the Portuguese adventurers of the fifteenth century they sailed southward in a series of expeditions designed partially to secure scientific information,

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[20] A. Hunter Dupree, *Science in the Federal Government* (Harvard U. Press, 1957), pp. 40, 42.

[21] *Ibid.*, pp. 56–61. Cf. Charles Wilkes, *Narrative of the United States Exploring Expedition During the Years 1838, 1839, 1840, 1841, 1842* (Philadelphia, 1845).

but primarily to open up a vast new continent to commercial exploitation. The most sincerely scientific American expedition was Lieutenant James Melville Gilliss's astronomical expedition to Chili in 1849-50. Gilliss's chief objective was to measure the distance of the sun from the earth by making an observation of the planet Venus at a time when it was being observed by astronomers at the Naval Observatory in Washington. This part of his plan was frustrated, however, when officials at the Naval Observatory failed to carry out their part of the operation.[22] Other expeditions sent to South America by the Navy included Lieutenant Page's expedition to the Rio De La Plata in 1853-56, Lieutenant Michler's Atrato expedition, a joint Army-Navy venture to reconnoiter for an isthmian canal, and the spectacular exploration of the Amazon and Orinoco rivers by Lieutenant William L. Herndon and Midshipman Lardner Gibbon.[23] This latter expedition was sent out purposely to survey the possibilities of the Amazon Basin for the establishment of a future slave empire when the South might be forced to give up its slaves due to Northern pressure. It was inspired by an arch-Southerner, Lieutenant Matthew Fontaine Maury, commander of the Naval Observatory in Washington and unofficial "Prince Henry the Navigator" to the American maritime expeditions of the whole period.[24]

The Herndon and Gibbon expedition inflamed the imagination of the whole country. Upon reading of it in 1853, young Sam Clemens quit his newspaper job and started down the Mississippi, determined to be a coffee planter in Brazil. It was only a lack of funds that prevented him from reaching the Amazon, and turned him instead to the profession of Mississippi riverboat pilot.[25] A few years later Frederick Church, a young Connecticut painter, also inspired by his reading of Humboldt and Herndon, actually made the journey to South America, where he

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[22] J. M. Gillis, *The U.S. Naval Astronomical Expedition to the Southern Hemisphere During the Years 1849–'50–'51–'52*, 33d Cong., 1st Sess., H.R. Doc. 121 (1855). See also John P. Harrison, "Science and Politics: Origins and Objectives of Mid-Nineteenth Century Government Expeditions to Latin America," *Hispanic American Historical Review*, v. 35 (1955), pp. 185 ff.

[23] Harrison, *loc. cit.*, pp. 187–202; and Dupree, *op. cit.*, pp. 95–96.

[24] *Ibid.*

[25] Van Wyck Brooks, *The Times of Melville and Whitman* (New York: E. P. Dutton, 1947), p. 195.

recorded on canvas the grandeur and sublimity so often felt by the explorers.[26]

Maury, as head of the Naval Observatory, served the cause of exploration in still another important way. He devised a system of logbooks to be carried by every merchant and whaling ship. These logbooks were forwarded to Washington and used by Maury to complete his important *Wind and Current Charts,* which amounted to a unique and accurate geography of the ocean. This project, along with his significant volume of *Sailing Directions,* has caused Maury to be regarded as a pioneer of the modern science of oceanography. His work also had the immense practical consequence of cutting the sailing time from New York to San Francisco by forty-seven days at a time when eager gold seekers had every reason to be eternally grateful.

Other naval expeditions of the period included Matthew Perry's voyage to Japan, Ringgold and Rodgers' North Pacific Exploring Expedition, and Elisha Kent Kane's voyage to the Arctic in search of the lost British explorer, Sir John Franklin. At the same time, too, Lieutenant Lynch was sent on a special mission to explore the Dead Sea and parts of the West Coast of Africa.[27] Thus, taken as a while, there was a considerable amount of official maritime exploration during the entire period. The official exploration was matched on sea as it was on land by the numerous private expeditions of whalers, sealers, and merchant adventurers. Any account of maritime exploration in this period can no more afford to ignore these than can the historian of the West afford to leave out the mountain men.

One further form of exploration during this period was the semi-private expedition in which a man received a governmental post which sent him to the place where he could do the exploring that he desired. The most notable examples of this were John Lloyd Stephens and Ephriam George Squier, who were sent to Central America on diplomatic missions so that they might explore the jungle regions. Stephens produced the monumental *Incidents of Travel in Central America, Chiapas, and Yucatan* which, with its magnificent illustrations executed by

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[26] Vernon Young, "The Changing Landscape in American Art," *Romantic Art,* Arts Yearbook No. 2 (1958), pp. 105–106.

[27] Dupree, *op. cit.,* pp. 95–100.

[28] J. L. Stephens, *Incidents of Travel in Central America, Chiapas, and Yucatan* (New York, 1841).

Frederick Catherwood, gave the first clear picture of the lost civilization of the Mayas.[28] Squier also produced some highly important archaeological works on Central America.[29]

Most of these men belonged to a curious literary group, interested in travel books, which met at Bartlett and Welford's bookstore in New York's Astor Hotel. The patriarch of the group was the aged Albert Gallatin; it also included such figures as Dr. F. S. Hawks, William Kennedy, George Folsom, and Brantz Mayer, author of *Mexico As It Is and As It Was*. On occasion, Edgar Allan Poe dropped in for meetings and gathered material for his own fictionalized versions of the travel book. The guiding spirit of the group was John Russell Bartlett, who got himself made United States-Mexican Boundary Commissioner in 1852 so that he could go to the Southwest and write a sequel to Stephens' enormously successful work on the Mayas. Bartlett proved to be a colossal failure as Boundary Commissioner; but he produced still another interesting travel book, his *Personal Narrative of Exploration in Texas, New Mexico, California, Sonora, and Chihuahua,* which is one of the most delightful books in the entire literature of the American West.[30]

In general these men produced works on the borderline between serious science and romantic travel literature in which the strange and the exotic were the most important objectives. As it was for Humboldt himself, it was quite difficult for them to separate the two because the main impetus for scientific investigation seems to have been generated by the romantic interest in the unique and the marvelous — in the minutiae of nature as well as in the extremities of the cosmos — that hung over and dominated the entire period.

Much of the literature of the day contributed to and drew inspiration from this spirit, suggesting that it was all part of an imaginative whole. Books like Francis Parkman's *Oregon Trail* or Washington Irving's *Astoria & the Adventures of Captain Bonneville* were romanticized chronicles that nevertheless also contributed factual information about the West at a time when such information was sorely needed. The

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[29] See E. G. Squier's *Nicaragua* (1852), *Notes on Central America* (1855), *Observations on the Chalchihuitl of Mexico and Central America* (1869), and *The Serpent Symbol and the Worship of the Reciprocal Principles of Nature in America* (1851).

[30] J. R. Bartlett, *Personal Narrative of Exploration in Texas, New Mexico, California, Sonora, and Chihuahua Connected with the United States and Mexican Boundary Commission During the Years 1850, '51, '52, and '53,* 2 vols. (New York, 1854).

Adventures of James Ohio Pattie, Lewis H. Garrard's *Wah-to-Yah and the Taos Trial,* and Josiah Gregg's *Commerce of the Prairies* all belong in this category. They conveyed much useful data about the West; but their chief significance was that they presented a picture of the West as an exotic unknown, a place of adventure for the man of spirit and daring to go and make his mark. In the 1840's and '50's the West was our Africa, or Polynesia, or the Road to Xanadu. Yet the majority of serious economic and political historians tend to take this for granted – if they do not scorn it entirely as a motive for moving West. The color and spirit of the West have been left to Hollywood, as if it never really did matter as an operative force which spurred people westward. But surely such a spirit played its part in the settlement of Western America and should not be overlooked. It was an integral part of the age.

It is relatively easy, for example, to trace the impact of the whole age of exploration upon imaginative and popular literature. Cooper used Sir John Franklin's expedition as source material for the *Sea Lions,* the Wilkes Expedition for the *Crater,* and the Long Expedition for the *Prairie.* Poe, always a devotee of romantic science, used the theory of Semmes Hole as the basis for his *MS. Found in a Bottle* and the *Narrative of A. Gordon Pym.* His work, usually regarded as science fiction, was actually more closely attuned to the age of exploration than it was to pure science. Indeed every major writer of the period was touched to some extent in plot, character, and imagery by the spirit of exploration. Melville was, of course, in *Typee,* so carefully researched, and in *Moby Dick* and *Mardi* and virtually all the rest of his work. Hawthorne had a fling at the travel book in his *Marble Faun,* and he too was swayed by the exotic. Emerson was devoted to Humboldt; and Thoreau, his friend, always traveled West in spirit from Walden Pond. Walt Whitman epitomizes the entire complex of travel, and the romantic exploration of the open road, with his endless catalogues celebrating everything in nature. He was likewise enamored with the idea of the West and the passage to India.

If we put all of these aspects of American culture together – the scientific, the literary, the impact of the frontier, the rational techniques and the romantic enthusiasms – we get a somewhat different perspective on this period of American history. What was happening on the trans-Mississippi frontier was akin to the activities on the Eastern seaboard. The drive for maritime expansion, as Professor Norman Graebner has

recently pointed out,[31] had as much to do with the course of Manifest Destiny as the desire for free land. All aspects of American expansionism were to some extent part of a larger impulse which was world-wide and extremely competitive. Intellectually, this might be explained by the fact that at this moment the scientific and rational mind of the eighteenth century was exposed to a true world horizon – and, as that mind went to work in the effort of comprehension, it became romantic. Whatever was but dimly known became irresistibly attractive, and it was this attraction itself that had much to do with stimulating the impulse of Manifest Destiny on a global basis.

Viewed in this way, the experience in the American West seems somewhat less than unique. Rather it appears as a part of a much larger whole – a great synthesis which extends all the way from the picturesque trappers' rendezvous in Cache Valley to the dimly lit study of Humboldt in Potsdam. When we have worked long enough and hard enough at studying this whole complex of ideas and emotions, we may perhaps arrive at a different view of our national and international history in which the old concepts will have been given a new and richer dimension. With particular regard to our own American West, we will have broken away from the old Turnerean tyranny which has failed to satisfy us for a number of years but which is still too valuable emotionally to part with completely. We will then be closer to understanding what the old Westerner meant when he said:

> It wasn't Indians that were important, nor adventures, nor even getting out here. It was a whole bunch of people made into one big crawling beast.... It was westering and westering. Every man wanted something for himself, but the big beast that was all of us wanted only westering.... It wasn't getting out here that mattered, it was movement and westering.[32]

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[31] Norman A. Graebner, *Empire on the Pacific: A Study in American Continental Expansion* (New York: Ronald Press, 1955), *passim*.

[32] John Steinbeck's "The Red Pony," in *The Portable Steinbeck* (New York: Viking Press, 1946), p. 414.

OVERLAND VIA "JACKASS MAIL" IN 1858

THE DIARY OF PHOCION R. WAY

edited and annotated by

WILLIAM A. DUFFEN

PART THREE

June 17th, [1858]. Arrived in Tubac[1] about 6 o'clock last evening. It commenced raining about 10 o'clock yesterday and continued at intervals during the day. This is the commencement of the rainy season; it will probably rain very frequently now for some time. It has cooled the atmosphere and the weather is much more pleasant now than it was a few days ago.

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[1]A Spanish presidio near the Indian village of Tu-baca on the Santa Cruz River 45 miles south of the present site of Tucson, Arizona. The need for a military establishment here was dictated by the Pima uprising of 1751 in Sonora, for which see three studies by R. C. Ewing: "The Pima Outbreak in November, 1751," *New Mexico Historical Review,* v. 13 (1938), pp. 337–346; "Investigations into the Causes of the Pima Uprising of 1751," *Mid-America,* v. 23 (1941), pp. 138–151; "The Pima Uprising of 1751: A Study of Spanish-Indian Relations on the Frontier of New Spain," *Greater America: Essays in Honor of Herbert Eugene Bolton* (U. of California Press, 1945), pp. 259–280. Wishing to retain their control of the northernmost reaches of Pimería Alta, the Spaniards established Tubac in 1752. It was later to be the headquarters of Captain Juan Bautista de Anza, who in 1776 led the party that located and settled what is now San Francisco, California. – See H. E. Bolton, *Anza's California Expeditions,* 5 vols. (U. of California Press, 1930). During the remainder of the Spanish and the whole of the Mexican periods, Tubac was abandoned and resettled several times. Three years after the Gadsden Purchase of 1853, it was taken over by the Sonora Mining and Exploring Company as a base of operations.

Tubac is a paradise compared with Tucson. The scenery is beautiful. It is situated in a beautiful valley [of the Santa Cruz River] surrounded by mountains. The valley and hills are covered with timber – mesquite and cottonwood of a large growth. It is refreshing to the eye to look upon green foliage and lofty trees after travelling so long over sandy wastes and boundless prairies. The health here is fine, the water good, and there is plenty of good wholesome food. The town is occupied principally by the Sonora [Exploring and Mining Company][2] and The Santa Rita Silver Mining Company.[3] They are so far as I have seen a fine looking intelligent set of men. Col. Poston is at their head here. He is a young energetic business man. His house (where I am now stopping) is more convenient, more comfortable, and better arranged than any house I have seen since I left San Antonio.[4] It is *adobe* like all the other houses in the place.

The town contains about 150 inhabitants, three-fourths of whom are Mexican. A small river called the Santa Cruz runs through the place, which furnishes the water for irrigating the bottom lands. It is now harvest time and the wheat looks very well. They raise grain enough here to supply the whole settlement and have some to sell. Col. Poston gets his supplies from Sonora and has plenty of everything that the comfort of his men requires.[5] He now has about 150 men

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[2] On p. 5 of the *Report of the Sonora Exploring and Mining Company, made to the stockholders, December, 1856* (Cincinnati, 1856), the following statement appears: "The Sonora Exploring and Mining Company was organized in Cincinnati on March 24, 1856, by a few gentlemen who were familiar with the mineral resources of that part of Sonora which came into our possession by the Gadsden Treaty. The object of the Company was to send an armed party of sufficient strength to protect itself against the Indian Tribes, to explore this territory and recover and hold possession of old Spanish mines, abandoned in consequence of the Apache War and Mexican Revolution. . . ." At the time of organization Major S. P. Heintzelman, U. S. Army, was named President; the "Commandant and Managing Agent in Sonora" was Charles D. Poston. On p. 4 of the 1857 *Report*, published in Cincinnati in September of that year, the capital stock of the Company is declared as $2,000,000 divided into 20,000 shares of $100 each.

[3] On p. 21 of Frederick Brunckow's *Report to a Committee of the Stockholders of the Sonora Exporing and Mining Co.* (Cincinnati, 1859), the following appears: "The Santa Rita Mining Company was organized in the year 1858 under the laws of Ohio; captial stock one million dollars; office, No. 167 Walnut Street, Cincinnati, Ohio." Officers were Dr. George Mendenhall of Cincinnati, President; Thomas H. C. Allen of Cincinnati, Vice President; Thomas Wrightson of Cincinnati, Secretary; and William Wrightson of Cincinnati, Director of the mines. Cf. *The Third Annual Report of the Sonora Exploring and Mining Company made to the Stockholders, March, 1859* (New York, 1859)," The Santa Rita Company formed on a portion of our possessions went out under the management of W. Wrightson. . . . He is pushing forward the works with great energy. . . . Mr. Grosvenor, the agent first sent out, was placed by Mr. Poston in quiet and peaceful possession. . . . The Sonora Company owns 4,500 shares of the Santa Rita Stock."

[4] The late Frank J. C. Griffin of Tubac and Tucson, who for several years pursued a careful study of Tubac, thought that the house occupied by Poston was directly across the plaza from the "tower" building, which was the headquarters office and store of the company.

[5] There were three sources of supply at this time: Indianola on the coast of Texas, Yuma, and Guaymas, Sonora. The great distance from Indianola to Tubac, and the deserts between Tubac and Yuma on the Colorado River, caused the Guaymas road to be preferred. At times of tension between the United States and Mexico – such as that produced by Henry A. Crabb's filibustering activities in 1857 in Sonora – the Guaymas route became hazardous.

employed in his mines, which are over 20 miles from here in the mountains. All the labourers are Mexican, as they can be hired much cheaper than white men and are accustomed to this kind of work.

Santa Rita Camp, June 19th. I am now on the ground where the new town of Santa Rita will be built. My partner and myself came here yesterday along with Col. Poston, 3 of his men and three Mexicans, for the purpose of laying out a *Ranche [Rancho]* for the accommodation of the Santa Rita Mining Company, a branch of the Sonora Mining and Exploring Company. The balance of our company will be here in less than two months and it is our duty to have houses built ready to receive them.[6]

The rainy season has not yet commenced and the weather is fine. We must do our work while the sun shines. Yesterday we all (except the Mexicans) visited 4 or 5 of the principal mines[7] in the Santa Rita mountains. We rode on mules as far as we could then climbed the rest of the way. I never before visited the top of a mountain and found it very hard work. I came near giving out before I reached the top, and I feel the effect of my over-exertion today. Coming down the mountain, my saddle girth came undone and I was thrown off in a steep and rocky place. Yesterday was the first time I was ever on the back of a mule and I was a little awkward at first, but I will soon get used to it.

Today I am left alone with the three Mexicans. Col. Poston and his brother[8] have returned to Tubac and my partner[9] and two others have gone to Fort Bu-

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[6]They were anticipating the arrival of William Wrightson, one of the officials of the company, within a few months, with machinery and other necessary equipment. Wrightson's expedition was to follow the same route from Cincinnati that Way had taken to get to Tubac. In an article in the (Tucson) *Arizona Weekly Star* of March 11, 1880 ("In Memoriam to William Wrightson"), Poston states that Wrightson did not arrive until January, 1859, bringing with him materials representing an investment of several hundred thousand dollars. The first printing press brought into Arizona – and the one used to produce the *Weekly Arizonian*, its first newspaper – probably came in this caravan.

[7]Which specific ones they visited is not clear. It is probable that they included some of those referred to in the following selected references. On p. 6 of the 1857 *Report* it is stated that the company held title to "twenty-four veins of silver ore in the Santa Rita Mountains, among which are the old mines of Salero and Ojero." On p. 231 of *The Apache Country: A Tour through Arizona and Sonora* (New York: Harper, 1869), J. Ross Browne tells of a trip into the Santa Rita Mountains in 1863: "During the afternoon . . . we visited at least fifteen of twenty distinct mines. . . . Among these were the Salero, Chrystal, Encarnacion, Cazador, and Fuller." Frank C. Schrader, *Mineral Deposits of the Santa Rita and Patagonia Mountains, Arizona*, U.S. Geological Survey, Bulletin 582 (Washington, 1915), pp. 194–215, identifies several mines – the Florida, Salero, Montezuma, Old Mexican, and Alto – as originating before 1853.

[8]The *Census of 1860* shows that John Lee Poston, 30 years of age, was a native of Kentucky and a merchant at the Cerro Colorado Mine. His post office was Tubac. He was credited with property valued at $1,500. On p. 49 of Raphael Pumpelly's *Across America and Asia* (New York: Leypoldt & Holt, 1870), it is related that John Lee Poston was killed in 1861 by some Mexicans, along with two German employees, at the Cerro Colorado. He was buried at Arivaca.

[9]Horace C. Grosvenor. See Part One of "Overland by Jackass Mail," *Arizona and the West*, v. 2 (1960), p. 52, n. 34.

chanan 22 miles from here to get provisions, tools to work with, etc. They will not be back until about noon tomorrow. We cannot do anything at our new town until they return. This will suit the Mexicans because they are naturally lazy and are contented and happy when they have plenty to eat and nothing to do. But the time will pass very slow with me. I have no one to talk to. I cannot converse with them because I cannot speak their language, and if I could their conversation would not interest me much for they are very ignorant and not much better than the savages. They are very much afraid of the Apaches and could hardly be persuaded to remain here, and if we should happen to be attacked by the Indians I could not depend on them. There is not much danger of this unless a roving band should happen to pass us on some marauding expedition. If such a thing should happen we would stand but little chance; our only way would be to fight to the last. There is no chance to run. I have a Sharps rifle[10] and a six shooter[11] and I feel tolerably safe. The last party of Spaniards that attempted to work this Salero mine – 25 in number – were all killed by the Indians.[12]

June 20th. This is the second day I have been here alone. It is true I have three Mexicans here – two men and one woman hired as servants to our party. They are as stupid as asses. I cannot make them understand what I want done, and I would rather be entirely alone. I was not well yesterday owing probably to my over-exertion and exposure in the hot sun, and I did not want them to cook me any dinner, but I couldn't make them understand me and they went to more pains than usual to get me a big dinner. I wanted nothing but a little *Panile [pinole]* for supper, but they built a fire, made me some tea and cooked some meat which they had to eat themselves.

I had a violent chill last night and I was afraid I was going to be sick, but I feel very well this morning and I think it will soon wear off. I will fight against it very hard for I would regret extremely to be taken sick just as we are about beginning operations. When it began to grow dark last night my Mexicans got very uneasy about the Indians. They dread the fierce Apache more than they do the Devil himself. They have committed depredations at Fort Buchanan and Tubac lately and if they should happen to know of our being here with so many stores they would be likely to attack us.[13] They have not been seen in these moun-

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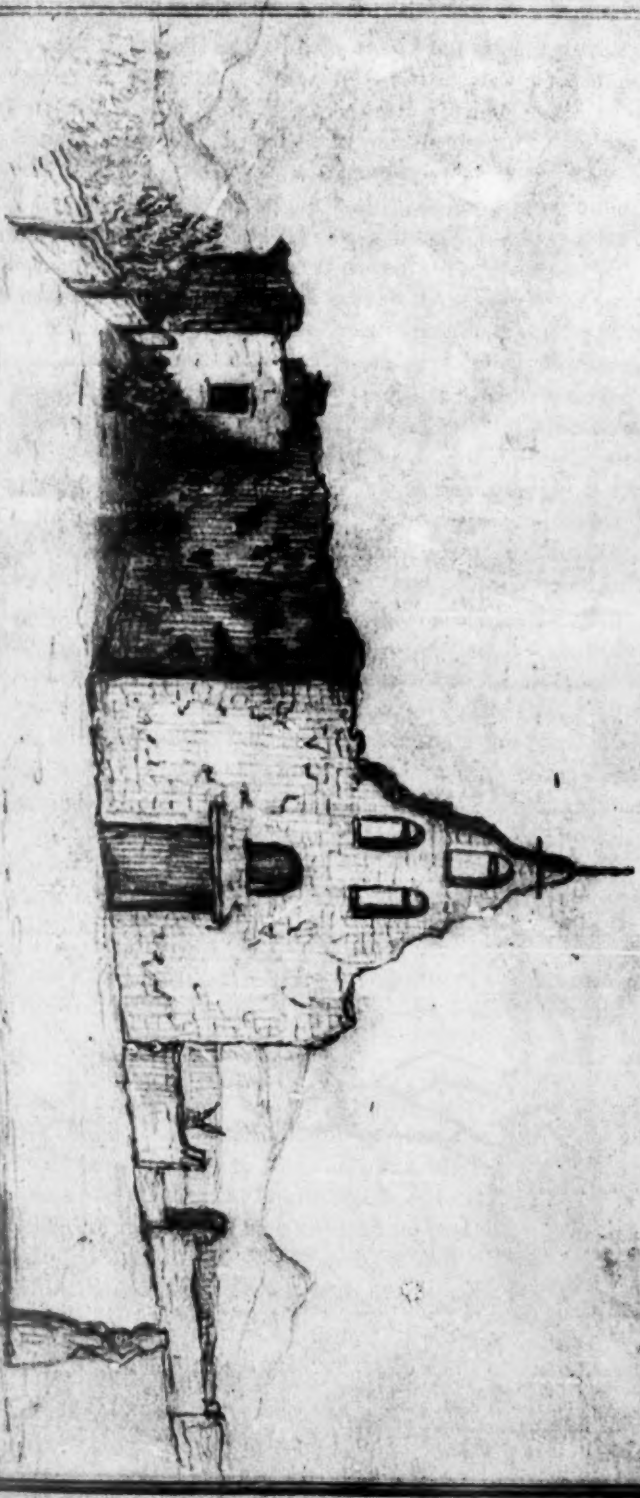
[10]The Sharps was patented in 1848 by Christian Sharps (1811–74), an American mechanic and inventor. It was a breech-loading rifle for military and sporting uses, manufactured at the Sharps firearms factory at Hartford, Conn. During the Civil War a shorter version, the carbine, was a favorite cavalry weapon. The common bore size was .52 caliber, with accuracy up to 300 yards. A rate of ten shots a minute could be achieved.

[11]On the inside of the back cover of Way's Diary is found the following entry: "The number of my Colts revolver is 62597." It would be remarkable should this gun turn up after a hundred years!

[12]No further information concerning this incident has been found.

[13]Reports of such bold attacks were not rare. The Apaches made life for the soldiers at Fort Buchanan an uneasy one. Well-fortified ranches and settlements often were successfully attacked and plundered.



Old Catholic Church Yorkville

Mexican Wagon & Oxen

tains lately and Col. Poston would not have left me here with only two Mexicans if he had thought there were any Indians about, but sometimes the sly devils are about when we least expect and I thought it best to keep a sharp lookout. I gave each of my Mexicans a rifle and lay down in my blanket with my sharp shooter [Sharps rifle] and revolver by my side. The guns belong to our company and were at my disposal. The Mexicans were unarmed.

We all sleep on the ground in our blankets. Our camp ground is under the shade of a large walnut tree (large for this country). We have a cupboard which Col. Poston made out of an old box. It is placed in the fork of a tree and contains our few dishes. Our provisions, etc. are scattered around on the ground. We are immediately under a rocky bank and the rocks serve us as shelves.[14] All our mules are gone to the fort but one, and we tied him close to our camp. Late in the night this mule began to snort, and keeping his eyes fixed upon a ravine close by became very restive, and behaved in a singular manner. Both the Mexicans sprang to their feet, and grasping their guns came to me with eyes as big as saucers, and made me understand very plainly this time that they thought the Indians were about. They thought the *"mule smelt Indian."* Such is a well-known fact: a mule is very much afraid of an Indian and can smell one a long distance. I examined my arms to see that they were all right, and then peered around in the darkness as well as I could, but could see or hear nothing. I rolled myself in my blanket and lay hard down again leaving the Mexicans to keep watch until daylight. I am satisfied that there was something in our vicinity that the mule was afraid of, but I suppose it was a bear as the mountains here are full of them. They are a large brown species and the hunters say they are as fierce as the grizzly. They will generally attack a man whenever they meet him without waiting to be provoked. I felt more afraid of them than I did of the Indians. They might have been attracted to the camp by the smell of provisions. They are very hard to kill, and a very dangerous enemy.

The rest of my party will return today from Fort Buchanan with provisions, tools, etc.

June 21st. I feel fine today. My slight indisposition was caused by too violent exertion in the hot sun. It is almost impossible for a man to be sick in this pure bracing atmosphere. My party returned from Fort Buchanan about 4 o'clock p.m. yesterday with two pack mules loaded with the articles we require.

I entertained three or four travelers in their absence. Hospitality is a characteristic feature of this thinly settled country. Whenever a weary traveler chances to pass our way we invite him to stop and rest himself on a blanket and partake of a little *Panola [sic]*. This is a favorite article of food in Mexico. It is composed of parched corn ground as fine as corn meal and mixed with a little sugar and water. It is very good and keeps a long time. With a small bag of this a Mexican or hunter will make a journey of hundreds of miles.

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[14] Details of this camp are shown in Way's sketch entitled "Our first camp at Santa Rita, June 18th, 1859," appearing in this issue.

Today we have been out prospecting for a better location for our town. We have found a spot half a mile nearer the mines, admirably adapted by nature for our purpose.[15] It is a gentle knoll bounded on three sides by mountains and on the other by the creek. By digging a little we can get permanent water, and the abrupt hills will serve as a natural barrier to prevent our stock from ranging too wide. It is in open view of the mines which is a great advantage. We can establish signals if necessary.

Today I will have to start to Poston's mine[16] to get our axes ground and some other necessary articles we require. I [will] ride a mule and take a pack mule and morrow morning. I will have a long ride of 74 miles which will take me three days. I go by way of Tubac and will stop there to rest. It is very fatiguing riding in this hot sun. We have also been looking around for timber to build our houses and have found some that will answer. Our first house will be what is called a Picket house – the timber will be set on end in the ground and it will be covered with willow branches and straw.[17] When we are better established we will build adobe houses. This is only temporary.

June 25th. Returned last evening from my visit to Tubac and the mines [of the] Cerro Colorado[18] and Arabac Co.[19] I have ridden nearly 100 miles and feel a

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[15]The site was known later as *Hacienda de Santa Rita.* Here the headquarters of the Santa Rita Mining Company were established under the supervision of Horace C. Grosvenor and Phocion R. Way in the fall of 1858. In 1860 a small smelter was bulit here by Raphael Pumpelly. Pumpelly, in his *Reminiscences* (New York: Holt, 1918), v. 1, p. 224, tells of the abandonment of the site on June 15, 1861, as a result of continued attacks by Apaches following the removal of Federal troops from Fort Buchanan; and he reproduces (*ibid.*, v. 2, facing p. 766) a photograph of the "Ruins of my old furnace at Santa Rita."

[16]Also referred to as the Heintzelman or the Cerro Colorado (Red Hill).

[17]Way's sketch of "our first house at Santa Rita, July, 1858," appears in this issue. A good description of it is given by Horace C. Grosvenor in a letter written to his wife from Hacienda del Santa Rita, Gadsden Purchase," dated July 11, 1858. The letter is partially transcribed in Frank C. Lockwood's *More Arizona Characters* (U. of Arizona, 1943), "Since we came out I have had a house 15 feet by 21 feet put up.... Our house or 'casa' fronts the north and is situated on a small mesa, or elevated knoll between two arroyos or creeks in one of which is our spring about 75 yards from the back door. At one corner, northwest, stands an acacia or mesquite tree, another in front, and one just before the kitchen down on the path to the spring. We have a tent pitched about 25 yards east of the 'casa' beneath three or four sheltering acacia trees...."

[18]The Cerro Colorado was a mining area located some 22 miles to the west of Tubac. The major mine was the Heintzelman. Originally the Sonora Exploring and Mining Company had planned to work the Santa Rita area, but when much richer reposits were discovered near the Cerro Colorado operations were transferred there. For an interesting sketch of the Heinzelman mine and the Cerro Colorado see the 1857 *Report*, p. 12. Also see J. Ross Browne, *The Apache Country*, p. 264 ff.

[19]In a description of the properties held by the Sonora Exploring and Mining Company in their 1857 *Report* we read (pp. 5–6): "The Arivaca Ranche, or as the Mexicans call it, *La Aribac*, is situated fifteen miles South of West from Tubac, and contains over seventeen thousand acres of agricultural land, with permanent water, wood and grass. It contains twenty-five silver mines, which were worked by the Mexicans previous to the Apache War, and which were famous for their yielding rich ores of silver, lead and copper, and containing small quantities of gold. The most famous of these mines were Mina San Jose, Mina Santa

little fatigued; I left my Mexican and pack mules at Tubac and from there I traveled alone over a country I had never seen before. Of course I carried my rifle and side arms with me. I never go out without them in this country.

There is only one habitation between Tubac and Cerro Colorado, a distance of 22 miles. This is occupied by Col. Douglas[20] an old frontiersman, who has lived 25 years in Mexico. He built his present ranche *[sic]* about 3 years ago when not another white man lived within 50 miles of him. He was told that the Indians would surely kill him, but he paid no attention to what was said and built his *adobe* house. His partner[21] was killed by the Indians about a year ago, but the old Col. is still alive. I stopped a few minutes at his house and got a very good dinner. It was not yet 11 o'clock but while he detained me talking a Mexican woman prepared me some dinner. Here among these wild men you will find true generousity *[sic]* and genuine hospitality. Col. Douglas has taken possession of a mine called the Sopori.[22] He now has a partner[23] living with him and is pre-

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Margarita, Mina Basura, Mina Blanca, Mina Arenias, Mina de Los Tajitos, La Mina de Amado, and La Purissima. The Sonora Exploring and Mining Company holds title to this important Ranche, by purchase from Tomas and Ignacio Ortiz, in whose family there is a perfect chain of titles as far back as 1802. . . ." Also see *Brief Description of the Arivaca Estate in the Territory of Arizona, United States of America* (London, *ca.* 1880), p. 18.

[20] In the (Tubac) *Weekly Arizonian* of Thursday, June 9, 1859, is the following notice of the "Death of an Old Citizen": "Col. James Douglass died at his residence, Sopori Ranche, on Tuesday the 7th. inst., aged about sixty years. The deceased was born on the Atlantic Ocean, while his parents were emigrating from Scotland to the United States, and his youth was passed at Wheeling, Virginia. About thirty-three years ago he came to Santa Fe, and ever since has lived in Old or New Mexico, having spent several years in the former country, and in the Revolution of 1836 held the rank of Colonel in the Mexican Army. He was one of the oldest settlers of this region, known and respected by all for his intelligence, his high sense of honor, and his unbounded hospitality. [He] was one of those few men against whom there was never spoken a word of slander; and it is worthy of special mention that those who knew him the longest were his warmest friends. Col. Douglass has done much toward developing the mineral resources of the country, and in every matter of business, possessed of an unusual degree of confidence in his fellow-men. He was buried at Tubac, the ceremony being performed by the Rev. Mr. Tuthill. Among the Americans present were several members of the Masonic Order, who performed appropriate ceremonies over the grave of their deceased brother." Douglass was on of the original developers of the Mowry Mine near Patagonia.

[21] Those who settled the Sopori with Douglass were William B. Rhodes and Christopher Dodson, both of whom were alive in 1858. The "pardner" referred to by Way is not identified at this time.

[22] According to Brunckow's 1859 *Report* (p. 21), the Sopori Land and Mining Company was organized in June, 1859, at Providence, Rhode Island. This corporation, formed about the time of the death of Douglass, included 21,000 acres. Pumpelly states in his *Reminiscences* that the Sopori was deserted in 1861 as the result of Apache raids. In later years, various individuals filed claims to the original Mexican grant of 142,721 acres. All were rejected by the United States Land Courts.

[23] Probably William B. Rhodes. In the (Tucson) *Arizona Weekly Star* of April 15, 1880 (" In Memoriam to William B. Rhodes"), Poston states that Rhodes was born in Kentucky about 1830, moved to Missouri and then to California for the gold rush. In 1855 he came to Arizona with Colonel Douglass and occupied the Sopori. In 1859, probably following the death of Douglass, he established a ranch near the Canoa, in the Santa Cruz. He made

paring to operate his mine. He has a number of acres of rich bottom land under cultivation and at the present time he is harvestion his barley. He hires Papagoes [Papago] Indians to do his work for him. He works but little himself and in this lonely spot with his pipe in his mouth and surrounded by his blood hound and mastiff dogs he appears to be contented and happy – "long may he wave."

I arrived at Cerro Colorado or Heintzelman mine about 5 o'clock in the evening. They have at present about 40 men at work here, superintended by 4 or 5 Americans who received me kindly and gave me all the information in their power. Mr. Brunknow[24] took me through the mines. They have only been worked a short time. They have only worked to the depth of about 30 feet, and sunk one shaft about 45 feet, and the yield of ore is very rich. It promises to be, and no doubt will be, the richest mine in New Mexico. They have hardly commenced work, yet the ore which they have taken out has been found to yield from $1000 to $6000 per ton.[25] I also visited the Aribaca mine at the request of Col. Poston, who I found at Cerro Colorado. He wanted me to see the smelting operation which was then in progress. It is distant about 9 miles. Before I arrived they had got through the smelting. I saw their furnaces, 900 pounds of metal, lead and silver together, and visited the mines.[26] They have been worked much deeper than the Heintzelman, but I do not think the ore is so rich. All the men here are Mexican and the superintendant is also a Mexican. He treated me very politely, showed me all around this establishment and before I left treated me to a glass of *mescal*. (I had an interpreter with me.)

From here I returned to Tubac, procured a yoke of oxen, two white men at $40 per month to help build our houses, and a Mexican woman for cook at $10 per month. I could not find the Mexican I had left here, this being St. Johns day,[27] a great day among the Mexicans, he had gone off on a spree. The oxen, white men, and cook were sent on and I waited to see if my Mexican would turn up; but he

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a reputation as an Indian fighter. After the removal of Federal troops from the area in 1861, Rhodes left, and settled on a ranch about sixty miles north of Fort Yuma on the Colorado River. In 1870 he drowned while trying to cross the river in a small boat.

[24] Frederick Brunckow, a mining engineer, was born in Germany about 1830. Following the Revolution of 1848 he came to the United States. In 1856 he joined the Sonora Exploring and Mining Company as it was outfitting in Texas for the Arizona jaunt. In 1858 he was among several who went to New York to report on the mines of Arizona. Returning the next year, he began his own mining operations in what is now known as the Tombstone District. He was killed by one of his Mexican employees and was buried in an unmarked grave several miles west of Tombstone. See (Tucson) *Arizona Weekly Star* of February 19, 1880 ("In Memoriam to Frederick Brunckow"); and Brunckow's 1859 *Report*, pp. 5–6. Also see B. S. Butler and others, *Geology and Ore Deposits of the Tombstone District*.

[25] Brunckow states in his 1859 *Report* (p. 41), that a good average for the mine was about $900 per ton. This average was to drop later, as common ore was encountered.

[26] See *supra* n. 19 for a listing of the mines of the Arivaca.

[27] A Feast Day honoring the memory of the baptism of Christ by John the Baptist. The celebration began early in the morning with singing and music, and later included bathing in a running stream. By afternoon the tempo of the celebration reached a new high: sports, especially horse racing and the ever popular cock-fights (mingled with much *tequila*), produced a rather boisterous ending to a day that had started out with pious intent. The

did not, so I left orders to have him sent on as soon as he made his appearance. With the pack mule and the other articles I had purchased, about 3 o'clock I started for Camp Santa Rita and got there about 6. I found my party all well and in good spirits. Mr. Fuller[28] had killed a tiger[29] in my absence and he and Grosvenor had quite a chase after a bear that ventured near the camp . . . but they did not succeed in capturing him. Bears are very numerous here of these species, the black bear, the brown or as it is called here the Cinnamon bear, and the fierce and dreaded grizzly.[30] The brown bear is the most common and is almost as dangerous as the grizzly. It will attack a man without provocation, but it is smaller and not so hard to kill as the grizzly. The grizzlys are not so numerous but there are a good many of them. The black bear here as everywhere is cowardly and will run from the hunter, and will not fight unless he is badly wounded or cornered and cannot help it. It was this last species that Grosvenor and Fuller chased from our camp yesterday morning.

I got our axes ground at Cerro Colorado. We will now go to work with our force to build us a substantial house before the rainy season sets in. We have no time to loose *[sic]*. The mail left this morning for Tucson. I was very desirous to send 2 or 3 letters, but I had no time or opportunity to write them. I wanted in particular to send one home to let them know that I am still in the land of the living. The next mail will not leave until two weeks from this time.

June 26th. We have succeeded in finding a better locality for our new settlement, and yesterday we moved our things to the new place. It has the advantage of being ¾ of a mile nearer the mines and on a gentle knoll, commanding a fine view of the country around. The Indians will have no cover to creep up under and we can defend our position much better. We have a spring of good water here, the best water I have tasted since I left the Rio Grande. We are progressing finely

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(Tubac) *Weekly Arizonian* of June 30, 1859, describes the celebration as carried out in Tucson.

[28] George W. Fuller is mentioned several times in various references associated with Poston: in Poston's *Record Book "A", 1856–61*, p. 195 (photostat on file in the Arizona Pioneers' Historical Society, Tucson), among a list of claimants to the Salero Mine, dated January 1, 1857; in *ibid.*, p. 199, as an associate of Poston, Ehrenberg, and others, on June 10, 1857, at the Arivaca Mine; and in *ibid.*, pp. 2–3, as a witness to a wedding performed by Poston at Tubac, February 14, 1858. Reference to Fuller ("Mr. Fuller of Mississippi") is found in Grosvenor's letter to his wife; Way's last mention of Fuller was made September 27, 1858. (Some time after this, but before the *Census of 1860* was taken, Fuller seems to have vanished from the scene: his name is not recorded in the *Census* for Arizona.)

[29] *El tigre*, a name commonly applied to the mountain lion, puma, or cougar by the Spanish-speaking people of the Americas. There is also a spotted cat, that comes into this area from Mexico, referred to as *el tigre*.

[30] Mr. Ted Knipe of the Arizona Game and Fish Department, in Tucson, has verified (as once indigenous to the area) the three types of bear identified by Way. The (Tubac) *Weekly Arizonan* for March 10, 1859, proposes that it is about time for the grizzly to be showing up in the Santa Cruz Valley; on June 9, 1859 the *Weekly Arizonian* tells of a man being severely mauled and bitten by a cinnamon bear in the Santa Ritas; and the issue of June 23 reports that three cinnamon bears have been seen drinking from the river some few hundred yards from the center of Tubac.

with our new house and other improvements. We have the foundation dug out and are hauling the logs with our oxen. Our 2 white men understand their business, they are worth half a dozen Mexicans to work. This morning we built an enclosure around our spring to protect it from the hot sun. In this way we will always have cool water.

Mr. Grosvenor, while guarding our new camp yesterday, saw Indians on a mountain in the distance, but they have not attempted to approach us and I do not think they will. We are now too strong for them to risk an attack.

This afternoon Mr. Fuller, Mr. Randall,[31] and myself will start on a bear and deer hunting expedition. We will take a pack mule with us in charge of our Mexicans, to carry our blankets, game, etc. We will sleep in the mountains tonight and return sometime tomorrow. I will have something to way about our trip when we return. We go on this hunt not so much as for sport as to provide ourselves with fresh meat. We have been out of fresh meat for several days and we cannot purchase any without losing so much time and going a long distance, and then we would probably have to pay an exorbitant price. We had better kill our own meat if we can.

June 27th. Returned from our hunt about noon today. I was an hour behind the rest. One of my boots gave out and exposed my foot to the ground, which retarded my progress very much. It was an odd boot that I put on my right foot to accommodate a bad corn. Such a pair in Cin'ti [Cincinnati] would have lasted me three months but here in these mountains they will not last three days. I had to walk very slow coming home. Almost every plant here is furnished with thorns of some kind, and at almost every step I pricked my feet, and the steep sides of some of the mountains are composed mostly of huge rocks and sharp stones. One of my feet is considerably bruised and lacerated. Had it not been for this I would have enjoyed my hunt very much. When we started we directed our course for the highest peak of the Santa Rita mountains,[32] which has the appearance of being only 4 or 5 miles distant but in reality is about 12 or 15 miles. The country looks very even between here and there, but I had no idea we would encounter such lofty mountains. If I had undertaken this trip when I first got here I don't believe I could have stood it, but by constant exercise I have become a little hardened. The whole day we were crossing a succession of deep canons *[sic]* and rugged mountains.

I being the "green horn," as the old hunters call a man here just from the States, I was expected to bring up the rear, and, of course, had but little chance to shoot game even if it had been plentiful, but yesterday it was unusually scarce.

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[31] William Randall, listed in the *Census of 1860* as a native of Maine and 31 years old, is classed as a laborer owning property valued at $1,500.

[32] "Old Baldy," or Mt. Wrightson (alt. 9432). It was called "Old Baldy" for Captain Richard S. Ewell, commanding at Fort Buchanan, who was prematurely bald. Later it was named Mt. Wrightson in memory of two brothers, John and William Wrightson, both active in the Santa Rita Mining Company, who died violently: John killed by Mexicans and William by Apaches. See Will C. Barnes, *Arizona Place Names*, ed. Byrd H. Granger.

We saw several deer in the distance, but could not get within shooting distance, but about dusk Mr. Fuller succeeded in shooting a large fat buck. About dark we encamped on the border of a deep canon which leads down from the main mountain, it is from 600 to 1000 feet deep and in some places the sides are almost perpendicular.[33] It was some time before we found a place where we could reach the bottom with safety. When we did so we found a cool, clear stream of running water. There are only a few places where the sun ever reaches th bottom of this grand ravin, and the water is in consequence very cold. It was delightful to us after our fatigue. It is said that there are many such canyons and hidden streams in these mountains, but the water generally dries up or sinks before it reaches the plains below. We had coffee, bread and salt with us, and we soon had a portion of our deer meat roasted at the fire. The hunters always cook their meat in the same way. They cut it in small slices, sprinkle salt upon it, string it on a long sharp stick, and hold it over the coals until it is sufficiently done. And it is really delicious cooked in this manner, at least I thought so, and I ate more meat at one meal than I would have eaten at home in two or three days.

It was a beautiful moonlight night and after we had finished our repast we spread our blankets on the ground and slept soundly on the mountains surrounded by bears, wolves, and perhaps by Apache Indians. But we were not disturbed in the night. When I lay on my back looking up into the clear starry sky out of this awful canyon, I could not help contrasting my situation with what it was a few weeks ago when I reposed on a soft couch, secure from danger or alarm. If I had been suddenly transported to such a scene as this, I am afraid that I would have passed a wakeful night. In the morning at daylight we each took a different direction to hunt an hour or two before breakfast. We all returned at the same time without having seen any game. We saw fresh bear and deer tracks in abundance, but the game was not to be seen. We saw several deer on our way home but did not succeed in killing another. At some future time when I have more leisure, I intend to take a hunt of several days in these mountains.

June 29th. We gave one of our Mexicans permission to visit Tubac on the 27th and he has not yet returned. We gave him an order for five dollars and several articles which are wanted in camp. We are afraid he has left us. These Mexicans frequently run away when they are permitted to get a little ahead. He may have remained to get drunk on his five dollars, but if we find that he has run away, we will make him pay the penalty of the Mexican law,[34] which is a fine of six dollars, bring him back with a ball and chain to his leg, and give him a good thrashing. Mr. Fuller started to town this morning partly for that purpose, but if our man has concluded to run off he is probably in Sonora by this time and beyond our reach. The Mexican peons here are no better than our slaves in the South, and not so well off.

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[33] Probably Temperal Canyon.

[34] No information relative to such a law has been found.

We are progressing finely with our picket house and I think that we will have it nearly, if not quite done this week. It is a rough, uncouth looking structure and would excite the rizibles [risibles, or laughter] of any architect in the States. I will have something more to say about it when it is finished.

Today I have been to the Salero mine[35] for the purpose of digging a trench around it to prevent it from being filled with water during the rainy season. I took a Mexican with me and worked hard this forenoon and partly accomplished my task. We neglected to take any water with us and suffered very much with thirst. Tomorrow I will finish the job. We are expecting every day that the rainy season will begin. We are working hard to get under shelter before it does begin.

June 30th. I have just returned from the Salero mine along with Grosvenor and our Mexican. We have completed a good trench to carry off the water from the mine, or rather to prevent the water from running into it. A shower of rain came up and gave Grosvenor and the Mexican a good drenching. I took refuge in the mine.

Mr. Fuller has returned from Tubac with our truant Mex. He says he only remained one day to attend a feast on Saint Somebody's day.[36] They have a Saints day to celebrate here about once a week and they will always take their time if they are allowed to do so. Their religion seems to consist chiefly in keeping these innumerable holidays and shooting off guns, getting drunk when they can get liquor to make them drunk and raising Hell in general. We gave our Mex a good scolding and set him to work again.

Mr. Fuller killed 2 deer on his way to town and brought one of them back with him. We have plenty of venison now. We are progressing with our house. We are cutting sticks for the roof today.

July 3rd. Our house is nearly finished and the rainy season (fortunately for us) has not yet set in. The roof is completed. Our house is built of very crooked logs, set up on end and buried about 10 inches in the ground. The logs are about 8 feet in length. We have a door on one side and a small window on the other. The logs

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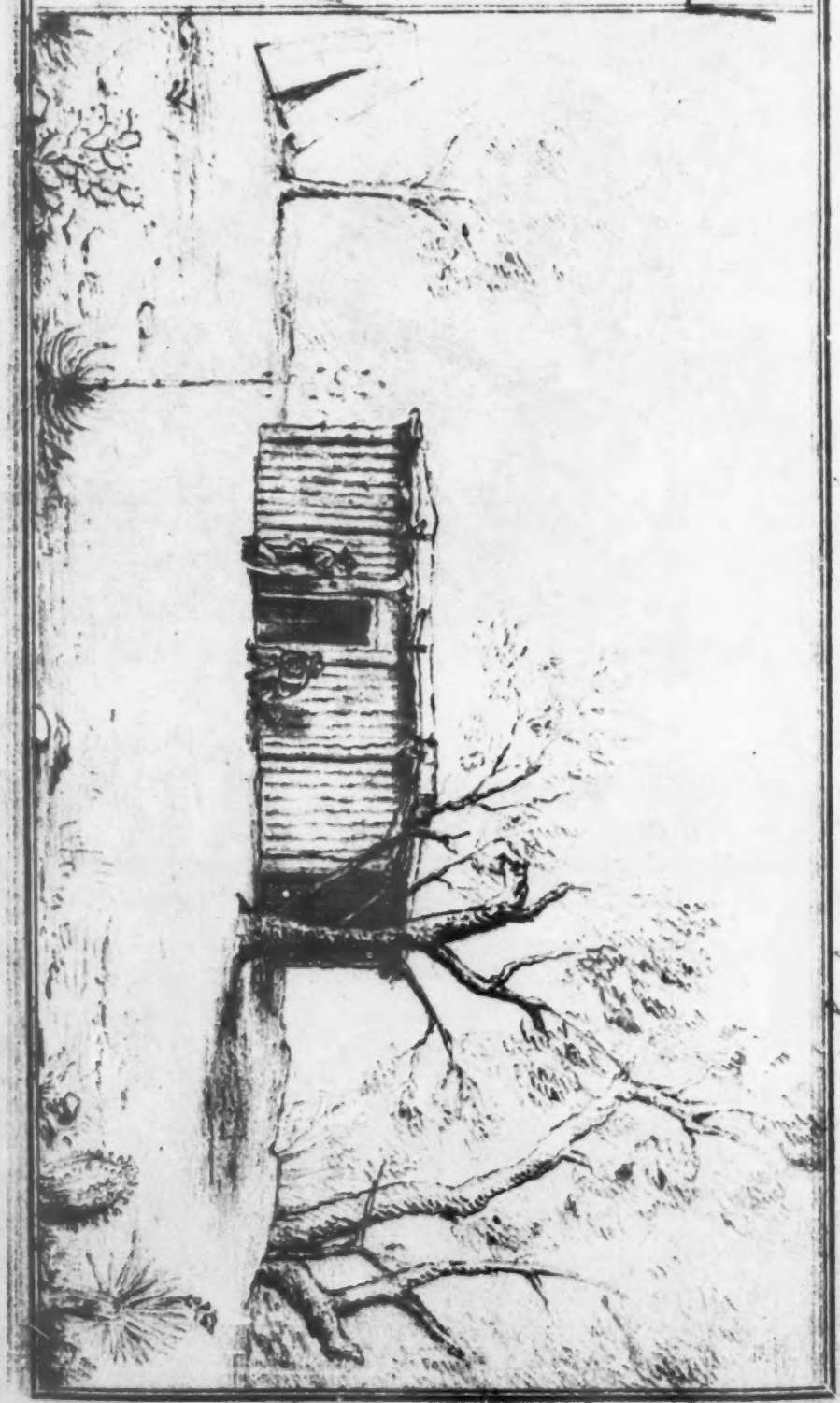
[35] The Salero [salt cellar] Mine, said to have been worked by the Spaniards as early as the seventeenth century, is located some distance up the face of Salero Hill. Legend tells us that the name originated when priests at Tumacacori, apparently working the mine, carved a salt cellar from a single piece of silver ore, to furnish a visiting bishop a service for his salt. The mine is known to have been worked during the Mexican period; and the reopening of the Salero was one of the main objectives of the original Sonora Exploring and Mining Company. During the Company's initial work here, however, a rich deposit was discovered 32 miles to the west at Cerro Colorado, after which operations were suspended at the Salero. Later, the Santa Rita Silver Mining Company reactivated this mine: according to the (Tubac) *Weekly Arizonian* for March 3, 1859, "The Santa Rita Mining Company have opened the old Salero mine, once celebrated for its richness throughout the region, and are also sinking several other shafts near the Salero. Buildings are being erected and preparations made for extensive operations." Also see Brunckow's 1859 *Report,* p. 6 ff.; also Barnes' *Arizona Place Names,* p. 324; and Browne's *The Apache Country,* p. 230 ff.

[36] San Pedro's Day. Apparently no rain followed the San Juan's Day celebration, since on June 29, San Pedro's Day, another plea for rain was made. When both attempts failed, the statues of the two saints were suspended heads down until rain did come.

MONDAY, December 27th, 1858.

Our fur. Camp at Santa Rita June 18th 1858



could not be made to fit close, and in some places stopped up with sticks and plastered on the outside with mud. The roof is composed of joists or *vegas [vigas]*, across these are laid small straight limbs like fishing poles, called *"okataea" [ocatilla]* on these are placed a layer of grass cut from the prairie, then a coating of clay or mud, and then another layer of dry earth and the roof is completed. It is, of course, very heavy and nearly flat. The floor is prepared by digging the earth loose and soft and then wetting it thoroughly several times, and when it is partly dry beating it down hard with heavy pounders. As yet we have no window glass or door and no furnitture. As soon as the floor is dry enough, which will be in a day or two, those who prefer sleeping in the house will spread their blankets on the ground, but I expect a majority of us will still continue to sleep in the open air when the weather will permit.

As for myself I like to see the stars above me and breathe the pure fresh air. I have got so familiar with Tarantulas, Centipedes, Scorpions and Rattlesnakes that I do not mind them, but they tell me there is one danger which threatens out door sleepers during July and August, which fills me with more dread than all the venomous reptiles and Indians thrown in – this new danger is from "mad wolves."[37] I have always associated everything that is horrible with the disease Hydrophobia and I would run faster from a Mad Dog than I would from a legion of Devils. The wolves are numerous here and in the two above named months they sometimes go made and in this condition they will enter a camp or town or even a house if the door is left open and bite everything in their course. At this season the Mexicans generally (those that have no doors) sleep on top of their houses out of reach of this danger. This horrible disease is much more common here among the wolves than it is among our dogs in the States. They are a terror to the whole country. One of our men told me of six persons who were bitten in this thinly settled neighborhood last year. One of them was badly mangled by the rabid animal, and in one instance the wolf entered a house and bit two persons. But what appears very singular to me, only one of these persons died. I have always been accustomed to look upon this disease as incurable, but here they have a stone which attracts the poison and when it is applied in time it never fails to cure.[38] This fact is so well established that I cannot reasonably doubt it, and it should be known far and wide that others may profit by it.

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[37]The wolf was common in the area at that time. Way's informant probably included the coyote, with the wolf, as subject to hydrophobia.

[38]An interesting documented instance of the use of a madstone to draw poison from an animal bite. Described by the *Encyclopedia Americana* as " a vegetable substance or stone which, when applied to a wound caused by the bite of a mad dog, is said to prevent hydrophobia," the madstone has been celebrated in literature (*e.g.* Sir Walter Scott's *The Talisman*) and is occasionally chronicled in the annals of Western lore. Some 130 cases of healing, attributed to the madstone, are on record; and there are reported to be three authenticated stones in the United States today. *Madstones and Twisters*, ed. Mody C. Boatwright, Wilson M. Hudson, and Helen Maxwell (Southern Methodist U. Press, 1958), is reviewed in *Arizona and the West*, v. 1 (1959), p. 185.

Mr. Grosvenor and three of our men started for Tubac at noon today in order to be there on the fourth. They have some things to purchase and they also wish to celebrate that glorious day in some suitable manner. They will be back tomorrow night. Our two Mexicans left us today. They have grown tired of living in the wilderness and have returned to the city of Tubac. One of them was a trifling fellow and I was glad he went. The other was a good fellow and I was sorry to part with him. They had a good permanent situation here, with little to do and plenty to eat, but these trifling, thriftless Mexicans only live for the present day and never think of tomorrow. Our white men say that they left us because we treated them too well. This is a singular reason but I think there is some truth in it. They have been accustomed to being treated as slaves, but with us they fared as we did and our gentle treatment has spoiled them and made them unfit for work. The common way here is to measure out so much flour and beans to them every week and let them cook it themselves, and give them no coffee, sugar or such luxuries – it is a common saying here "give a Mexican coffee and he will not work." This is the way we ruined our men. The are singular animals, and a man must understand them to know how to treat them.

Our cook has not left, but she is not a Mexican as I at first thought; she is a full blood Apache and is kept by one of our white men. There is so little difference between the Mexicans and Indians that I can hardly tell them apart. She will not leave on account of her man. All Mexican or Indian women here are very proud to get a white man for a lover. They will work and drudge for them and never leave them if they can help it. Nearly all Americans who have been in this country long keep a Mexican woman. It is so common here that no notice is taken of it. When they get tired of her or wish to leave the country they turn her off without ceremony. The women expect this, bear their loss with fortitude and console themselves with another man the first opportunity, but they will never have anything to do with a Mexican if they can get a white man. They tell me that the Mexican women are affectionate, warm hearted and generous to a fault, and if they were brought up in good society and surrounded by proper influences, I have no doubt they would make refined and virtuous women, but the way they are raised here you cannot expect anything better of them.

REVIEWS OF RECENT BOOKS

Review Editor:

JOHN PORTER BLOOM

WE ARE GRATIFIED to notice first, in this part of *ARIZONA and the WEST*, a publishing venture in neighboring Utah with which we may feel some companionship of spirit. *Brigham Young University Studies* appeared with its first issue in 1959 at about the same time we began publication, and if we have been slightly irregular in our publication dates we know that the editors of *BYU Studies* will sympathize with us for they seem to have suffered some similar difficulties in producing the three issues at hand as this is written. But perhaps not, for they appear not to have set themselves a schedule; subscriptions are two dollars for *four issues* rather than "per year."

Their purpose is "to be a voice for the community of L. D. S. scholars," which is at once more and less restrictive than our purpose. That is, they intend to publish material written only by Mormons; but their fields of interest are unlimited. In the issues we have appear articles not only on history but also on art, literature, religion, folklore, Hispanic culture and the United Nations. *BYU Studies* contains a book review section which has been devoted chiefly to books relating to Mormonism, but they evidently intend not to be restrictive here. The last issue includes a review of Jacques Barzun's *House of Intellect*.

The lead article of the first issue will interest historians. William Wilkes, of the BYU music faculty, writes of "John Tullidge: Utah's First Music Critic." Tullidge was a "professor of Harmony" who arrived in Salt Lake City in 1863, fresh from Liverpool. Lively, bold, cultivated and withal sensible, he did much in the ten years until his death to uplift musical activities among the Mormons.

He had no successor in nineteenth-century Utah, which was Utah's misfortune. Another article in this issue is of interest to historians in general, "Carl Becker and the Historian as Priest and Prophet," by BYU history professor R. Kent Fielding.

The second issue, combined Autumn 1959–Winter 1960, offers an interesting discussion by another BYU historian, Eugene E. Campbell, of "The Mormon Gold Mining Mission of 1849." Brigham Young bent every effort to prevent the California gold rush from distracting his followers from their project of building a "Wilderness Zion," but he did send two groups of young men to California late in 1849 to mine gold. This is their story. They suffered much and profited hardly at all, but two results emerged nevertheless: some of them went on to establish their church's mission in Hawaii, and wild dreams of wealth among other Mormons were tamed.

Two articles by Hyrum L. Andrus, also of Brigham Young University, appear in this and the Spring–Summer 1960 issues. "The Second American Revolution: Era of Preparation" is an analysis of American life in the period of the 1820's and 1830's, relating especially to the beginnings of Mormonism. "Joseph Smith and the West" relates the role of Joseph Smith in guiding his followers westward, and specifically to Utah even though he did not live to see the last phase of their wandering. Editors Ernest L. Olson and Clinton F. Larson may be proud that *BYU Studies* has got off to a fine beginning. We shall look for future issues with great interest.

THE MAKING OF AN AMERICAN COMMUNITY: A Case Study of Democracy in a Frontier County. By Merle Curti with the assistance of Robert Daniel, Shaw Livermore, Jr., Joseph Van Hise, Margaret W. Curti. Stanford: Stanford University Press, 1959. 483 pp. $8.50.

A Review Essay by

WILBUR R. JACOBS

Professor Jacobs presently is Chairman of the Department of History at the University of California, Santa Barbara. He is the author of two books on the American frontier, and is the editor of *The Letters of Francis Parkman*.

It is particularly gratifying that Merle Curti, one of Frederick Jackson Turner's most distinguished students, should prepare a historical case study of a frontier county of Wisconsin. The penetrating essays on Turner that have come from Mr. Curti's pen reveal his broad knowledge of Turnerean methodology and theory and show him to be exceptionally well qualified to undertake a task that presented more than ordinary problems of research and evaluation of evidence. The author and his associates have applied objective tests to Turner's frontier theory, especially the concept "that the most important effect of the frontier has been the promotion of democracy." They have confined the case study to a limited area that experienced the transition from a wilderness to a rural farm community. In gathering facts, the authors have found a rich harvest of material in census reports which has been analyzed by the objective quantita-

tive method of the social scientist. This has been supplemented by traditional historical research. The authors of this study of the development of democracy in a pioneer Wisconsin county in the years 1840–1880 have thus produced a unique book demonstrating that social science research techniques, largely neglected by historians, can be used with great effectiveness in the writing of history.

The large collection of Frederick Jackson Turner's papers at the Henry E. Huntington Library includes many items of correspondence and other materials showing that this is the kind of book Turner would have praised. These manuscripts, including Turner's research notes and drafts of speeches, confirm with certainty that the master himself was a student of all the social sciences and did not hesitate to borrow from the biological and physical sciences.

It is not generally known that Turner had a persistent preoccupation with the idea that the historical profession must be awakened to a awareness of the importance of allied disciplines in historical research. With negligible support from a few fellow-historians he took the leadership in scheduling conferences on the relationship between geography and history at American Historical Association meetings. Turner's correspondence of 1907 discloses that he found the geographers willing, even eager to participate in such an inter-disciplinary session; but there was considerable indifference among the historians. There was even a question of permitting the geographers to attend conferences of the American Historical Association since they were not actually members.

On other fronts Turner joined forces with the sociologists, read papers at their meetings, and urged, in a number of speeches, that historians re-examine their whole approach to historical investigation in the light of relationships between history and other fields of study.

If historians were to understand what Turner called "the trend of democracy in its social aspects" new kinds of sources and new kinds of evidence had to be accepted. Turner's views on this point are found in a letter of November 30, 1908, to his friend John R. Commons in which he said, "... there is, as you especially know, a mass of material on the genesis of social change, conscious attempts to see whither American society was tending and to effect its development in the interest of democracy, which are too little known."

In regard to techniques of investigation, Turner proposed a methodology for historians that has not, a half-century later, been fully accepted by modern scholars. In a lecture, delivered at Madison, Wisconsin, on October 16, 1901, the manuscript of which is still preserved in his files at the Huntington Library, Turner dealt with the whole problem of apportioning history among the social sciences. His solution was to advise historians to employ techniques that are not dissimilar to those used by Mr. Curti in his admirable study of *The Making of an American Community*. "No satisfactory undertaking of the evolution of this people is possible," Turner said,

> without calling into cooperation many sciences and methods hitherto but little used by the American historian. Data drawn from studies of literature, politics, economics, sociology, psychology, biology and physiography, all must be used. The method of the statistician as well as that of the critic of evidence, is absolutely essential. There has been too little cooperation of these sciences, and the result is that great fields

> have been neglected. There are too many neutral grounds left unculitvated owing to this independence of the sciences, too many problems that have been studied with inadequate apparatus, and without due regard to their complexity. I propose no solution to the difficulty; but it is important fairly to face it, and to realize that, without combined effort of allied sciences, we shall reach no such results in the study of social development as have been achieved in the physical world by the attack of problems of natural science by the combined forces of physics, chemistry, mathematics, and the like.
>
> In short, American history should be studied as one of the most illuminating contributions to the history of social development, and all of the apparatus needed to solve the problems arising from this conception of its nature should be used.

Although Turner, with some reluctance, conceded that he had "no solution" to the general problem of apportioning history among related disciplines, he did point the way by his own research, for his writings are based on evidence selected from a wide range of allied fields that have "illuminated" the social history of the American people. Turner, however, probed many of the border areas between the disciplines which, as he said, were "neutral grounds left uncultivated owing to this independence of the sciences." The diverse nature of Turner's investigations and the range of his interests are easily observed by a cursory examination of his voluminous research materials contained in forty-four filing cabinet drawers and in nineteen "three by five" file drawers. These are supplemented by a substantial collection of books and pamphlets from Turner's personal library which contain marginalia attesting to his desire to explore the results of research in many other fields in addition to history. Turner found his approach to American history so rewarding that he urged his colleagues to do more "historical and literary fishing" in sources which, he said, might disclose for the researcher, "that big trout of which he has dreamed all his life."

Turner's published writings, his correspondence, and the research materials he left behind suggest that his professional career was largely devoted to an attempt to understand the origins of the character and government of the American people. His writings concerned the development of the American people as a whole, and generalizations he made were based on a large mass of evidence which had been sifted and evaluated over a period of years.

Lecture notes taken by former students in Turner's classes, at the University of Wisconsin and at Harvard, indicate that he placed considerable emphasis on the westward movement of pioneers into what he called "physiographic provinces." These, over a period of years, emerged as sections, "or shadowy images of the European state," a federation of which formed the basis of the American republic. Turner also talked in terms of minor "physiographic provinces" which developed within the confines of the larger sections. Both the large and small sections, depending on physiographic factors, often crossed state boundaries and had much to do with the growth of democracy in local government. Turner's research notes disclose that he made detailed analyses of Midwestern sectional forces, often charted on maps and diagrams. These show that he found that counties and sometimes groups of counties formed smaller sections. Yet Turner himself, according to the evidence at the Huntington Library collection of his papers, did not undertake any detailed studies of these diminutive "sections" in order to examine the relationship between the frontier experience and the development of democracy in a pioneer community.

This challenging project has been undertaken by Mr. Curti and his associates in the case study of Trempealeau County, a small county of some 745 square miles bordering the Mississippi River and two of its tributaries, an area of relatively good soil which attracted pioneer farmers in the 1840's after the passing of the fur-trading frontier. The varied background of the settlers of this county, native Americans as well as English-speaking immigrants from the British Isles and Germans, Norwegians, and Poles, gave the authors an opportunity to examine the process of Americanization in a limited frontier area. Here Turner's ideas on frontier democracy and related topics such as land ownership and social mobility could be studied in detail.

Trempealeau has other advantages for a case study. Among these is an abundance of historical records on the county's period of settlement and early development. Ten newspapers, well-preserved county documents and a number of significant collections of private papers proved to be useful sources of information.

The book begins with an account of the main problems of the case study, the methods of research that were adopted, and a brief description of Trempealeau County. This is followed by a chapter on the early history of the county during the period of pioneer settlement. Hereafter the book is organized under topical chapters such as transportation and communication; social relationships and creeds; making a living; democracy in government; and educational opportunities. A carefully written conclusion brings together the most important results of the study, and an interesting discussion in the appendices deals with the difficulties encountered in using census data which provided most of the statistical information for the book's charts, tables and graphs. The reader will value a comprehensive index which increases this work's usefulness for reference purposes.

Although Mr. Curti had the assistance of collaborators who wrote certain chapters and brought together data from a wide variety of sources, the book is not a compilation of unrelated essays such as are sometimes found in a cooperative research project. This book has a clear scheme of organization together with summaries evaluating statistical evidence which are often compared with Turner's conclusions and interpretations of frontier history.

Of special interest are economic trends in settlement that emerged from statistics obtained in objective quantitative methods of research. It is possible to demonstrate, for instance, that foreign-born immigrants made substantial economic gains in one generation and that Norwegians, in this period, assumed positions of responsibility in local government. Through sifting of census data, real estate records, and various types of tax reports, the machine technique of investigation has revealed information that tends to conflict with previously held assumptions. The authors found, for example, that Poles and Irish, usually portrayed as under-privileged immigrants, made a more than adequate economic adjustment in the period under study. Another somewhat unexpected finding was that native American settlers exhibited a tendency to remain in Trempealeau County while many of the foreign-born moved on to other frontier areas. A third discovery, which appears in part to refute Turner's views, is that non-English settlers, with a few exceptions, failed to intermarry with native-born settlers during the early frontier decades. In spite of this instance of disagreement with

Turner's interpretations, the authors conclude that the most important implications of the frontier theory and democracy are supported by their study of Trempealeau County.

When the authors appraise the intangible aspects of the growth of democracy which are difficult to measure by tax reports and census data, the long-accepted methods of historical investigation are employed. As an illustration, reliance was placed on newspapers in writing the chapter on "Social Relationships," although a table on nativity groups and intermarriages makes an important contribution to this part of the book. The chapter on "The Social Creed" is likewise based primarily on traditional techniques of research in dealing with such topics as patriotism, religious activity, and cooperative effort.

The reader of this informative book is left with several distinct impressions. Not the least of these is the time and expense involved in quantitative research, the processing of census information, and the analysis of statistical data. Making a "layout for data sheets," transferring the information to punch cards, working out numerical codes, and coping with errors of census takers, requires, it appears, a team of competent researchers and expensive equipment.

Turner, it will be remembered, made use of census reports, but relied primarily on conclusions reached by the Superintendent of the Census. There are few tables of figures in his published writings, although he did record data on maps. Yet Turner attempted no quantitative research analyses of census materials that would compare with the project undertaken by Mr. Curti. Turner's personal copies of census bulletins in his papers at the Huntington Library have occasional underlining of statements he quoted and indicate that he made no serious attempt to use the techniques of the statistician of his day.

Mr. Curti's study makes it clear that modern historians have much to learn if they hope to utilize the machine methods of the social scientist. Examination of a number of graphs and tables in this book indicates that Mr. Curti and his associates have performed a remarkable task in utilizing evidence from conventional sources and merging this with data from punch cards. Yet there are instances where the authors appear to have had some difficulty in phrasing generalizations. An example appears on page 78 where Table 9 offers a comparison between property structures in Vermont townships and in Trempealeau County. In commenting on curves in Fig. 1 accompanying this table the authors observe that the property structures are "strikingly similar." Examination of Table 9 indicates that this observation is in large part true; but it also appears that the per cent of property owned by the lowest 30% of people of Trempealeau County is about 75% greater than that owned by the same portion of people in Vermont. Another minor point is that some generalizations would have more force if they were supported by relative data. A case in point is on page 344 where the authors indicate that in Trempealeau "it is clear that there was fairly wide participation in the Republican conventions over these years. . . ." This conclusion might be reinforced by information describing the kind of participation one found in other Wisconsin counties.

A final impression of this case study is that it is a remarkable achievement, one that makes a significant contribution to the writing of American history. The

authors, in the Turnerean tradition, have demonstrated that by a careful selection of a subject and by working with what appear to be ample research funds and equipment, quantitative methods of research can be successfully combined with traditional techniques of historical investigation. The reader who examines this book in detail with its sixty-two tables of charts and figures cannot help but appreciate the vast amount of research in a project of this kind. He is also convinced that Merle Curti and his associates have opened the door for quantitative research in historical writing with a brilliant example of what can be done.

THE PERALTA GRANT: James Addison Reavis and the Barony of Arizona. By Donald M. Powell. Norman: University of Oklahoma Press, 1960. 186 pp. $3.75.

reviewed by

WILLIAM S. WALLACE

The reviewer is Librarian and Archivist of the Rodgers Library at New Mexico Highlands University. He is also Acting Director of the Historical Society of New Mexico and author of three books on Western history.

James Addison Reavis almost became one of the world's greatest specialists in forgery and real estate manipulations. In the 1880's he attempted to parlay these two specialties into one of the greatest swindles in the history of the American West – and he almost got away with it.

With bogus Spanish documents (before it was over he forged over 200 documents and signatures) and a glib tongue he attempted to lay claim to a mythical land grant in Arizona and western New Mexico comprising some 7,500 square miles. Only painstaking efforts on the part of government agents finally uncovered the fraud and let to Reavis' exposure during the trial of the case before the U.S. Court of Private Land Claims in Santa Fe in 1895.

The author is Reference Librarian at the University of Arizona. He has done an excellent job of bringing together varied sources and presenting them in a narrative that reads well and is a valuable addition to Southwest Americana. The part-title drawings by Joe Beeler together with some well-chosen photographs add to the attractiveness and usefulness of the book.

A ROUNDUP OF WESTERN READING

by

THE OLD BOOKAROOS

B. W. Allred
J. C. Dykes
F. G. Renner

Editor's note: Because no single magazine or journal in the United States serves effectively as a clearing house for the large varieties of Western literature in current publication, *ARIZONA and the WEST* wishes to devote considerable space in each issue to reviews and notices of every type of recent Western book. Three of America's most ardent and knowledgeable bookmen – B. W. Allred, Jefferson C. Dykes, and Fred G. Renner – contribute a section of brief notices to supplement our regular full-length reviews. They are know as "The Old Bookaroos" and use Charles M. Russell's depiction of three riders as their literary trademark. Each was born in the West – Allred in Utah, Dykes in Texas, and Renner in Montana – and each was educated in a Western university. Each has lived and worked in all seventeen Western states, and each is now a technical authority with the Soil Conservation Service of the Department of Agriculture in Washington, D.C. All three are members of the Potomac "Corral" of Westerners, and corresponding members of the "corrals" in Chicago, Denver, Los Angeles, New York, and Wyoming. All three are large collectors of Western Americana, and each is an author in his own right.

Frontiersmen with guns tamed the West for the oncoming settlers that founded modern Western civilization. The kinds of guns used by early mountain men, trappers, soldiers, Indians, and buffalo hunters are described in *The Plains Rifle* (Stackpole, $10) by Charles E. Hansen, Jr. The term "Plains Rifle" is not used to define a certain firearm but is used to cover the variety of guns used by

early Westerners. There were many guns that belong to this age: the Hawken, the Henry and others were part of the "Plains" group, and so were handguns and shotguns. Here are vivid discussions of guns, gunsmiths, and the men that carried them such as Jim Bridger, Daniel Boone, Kit Carson, Dick Wooten, General Ashley, Joe Meek, Lewis and Clark, John Colter, Buffalo Bill, and many others. There are numerous photographs and drawings of a large variety of firearms. The book is an excellent guide for those wanting to know when various models were invented and used.

Colt (Stackpole, $10) by James I. Mitchell is a collection of letters and photographs about incidents in the life of Samuel J. Colt, dean of the pistol makers. Mitchell has performed a minor miracle in collecting and sorting as well as arranging a vast number of old letters so as to tell a coherent story of Colt's life as an arms designer, manufacturer, and merchandiser. Colt was energetic, proud, and devoid of sham and pretense. He was impatient with his unimaginative company officers because they did not succeed in selling his excellent revolving pistols. He had collaborated with Captain Samuel Walker of the Texas Rangers to produce the Walker pistol, and the modified version of this arm became the superior dragoon pistol. How Colt made his name supplying handguns and rifles in the Mexican War is described in this handsome volume, which is illustrated by numerous pictures of various Colt models. The book will appeal to an immense group of Westerners, gun collectors, army men, and arms manufacturers.

Larry Koller's *The Fireside Book of Guns* (Simon & Schuster, $12.95) is billed as the story of firearms in America – from the first explorers to today's sportsmen. It is all that and more; it is one of the most beautifully illustrated books that this reviewer has been privileged to examine in many a day. In addition to the numerous color reproductions of paintings by our great Western artists (Remington, Russell, Catlin, Eggenhofer, Bingham and others), the many photographs in color and black and white are superb. Koller is a gunmaker and a noted hunter, and his text is more than satisfactory. He had the help of Harold L. Peterson, historian, and of Herb Glass, gun consultant. In the end, however, it is the work of the five-man camera team that has given this book its special distinction. It has to be seen to be truly appreciated – a magnificient picture history of firearms.

The Saga of Ben Holladay (Hastings House, $6.50) by Ellis Lucia is the biography of a magnificient barbarian, the boss of the plains and king of Concords, mails, men, and mustangs. Ben never achieved the celebrity of such of his friends or employees as Buffalo Bill, Wild Bill Hickok, Asa Mercer, Mark Twain, Bringham Young, or the infamous Jack Slade. But the author claims that Holladay was the greatest transportation monarch this nation has ever known. Ben amassed more power and wealth than any other Westerner; developed and ran the Overland Stage Line, steamships, riverboats, and railroads; and built towns along his transportation routes. In the skull-cracking competition, Ben struggled and won, but finally lost. The huge overland freighting combine of Russell, Majors, and Waddell crushed him against the wall for a time but Ben staggered along until

this large firm was trapped in a Congressional investigation that bled them white. He bailed them out and took them over. The bold operations of this showman and gambler put him in the clutches of enemies who closed him out and robbed him of the prestige due him as one of the greatest Western empire builders.

Pioneers of the Trail (Greenwich, $2) by Mrs. Artie Elizabeth Freeman is a collection of her husband's pioneer reminiscences as a cowboy, rancher, and saloon-keeper. Mr. Freeman knew the Apache Kid, Cochise, Geronimo, and many notables and rowdies of his time. Freeman worked a big range and threw a wide loop. The assorted tales, however, are too briefly told, leaving the reader with the notion that a lot of good stuff has been left out.

A Lady's Life in the Rocky Mountains (University of Oklahoma Press, $2) by Isabella L. Bird is a travelogue of a maiden lady's Rocky Mountain adventures, as it appeared first in a genteel British weekly in 1879. Her experiences are told in letters to her sister, here published as Volume Fourteen in the Western Frontier Library. She made her Rocky Mountain expedition as a side trip on her way back to England from Hawaii. This nervy spinster climbed Long's Peak, was guided through Estes Park by desperado Jim, roughed it in chilly camp grounds, and witnessed the activities of vigilance committees.

Walter Fulcher's *The Way I Heard It* (University of Texas Press, $2.75) is a slender volume of tales of the Texas Big Bend as edited by Elton Miles. Fulcher had been soldier, sheepherder, and cowboy before he became a dry rancher and school-board member in the Terlingua desert. He was friendly with the Spanish-speaking people, and they told him the tales set forth in this book. Fulcher added some tales of outlaw doings from his knowledge – the most revealing about the killing of Ben Kilpatrick, the "Tall Texan" of the Hole-in-the-Wall Gang. These tales are plain wonderful and make you wish there were more. The photos are very good indeed, and the book is worth the money.